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History of Air Navigation

World's Aircraft Records

Organization and Work of U. S. Air Services—Described
by Officials in Charge

Aeronautical Activities in Federal Departments

How Air Forces in Other Countries Are Organized

The Proposal to Create a Department of Aeronautics—
Pro and Con Discussion

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The Congressional Digest

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Aircraft and the National Defense

OUR country represents nothing but peaceful intentions toward all the earth, but it ought not to fail to maintain such a military force as comports with the dignity and security of a great people. It ought to be a balanced force, intensely modern, capable of defense by sea and land, beneath the surface and in the air. But it should be so conducted that all the world may see in it, not a menace, but an instrument of security and peace.—*President Coolidge, Inaugural Address, March 4, 1923.*

History of Air Navigation

History of Lighter-than-Aircraft

FROM earliest history the mind of man has been directed to the discovery of the art of flight. The practical navigation of the air came first through the balloon, and the Montgolfiers are generally credited with the first practical demonstration.

Henry Cavendish, of England, ascertained the specific gravity of hydrogen gas or "inflammable air," as it was called then, and published a report in 1766. In 1782 Tiberius Cavallo wrote on the Cavendish report and said he himself had thought of the possibility of constructing an aerial vessel using hydrogen.

The following year Dom Gauthy proposed a balloon of copper filled with hydrogen with an internal bag of flexible material.

It remained, however, for Etienne and Joseph Montgolfier to demonstrate the possibilities of ballooning. The Montgolfiers built a spherical paper balloon, having a dimension of 35 feet, with an ascensional force of approximately 500 pounds. The balloon was sent up from Annonay, France, without passengers on June 5, 1783, in the presence of many spectators.

In August of the same year, a committee appointed by the *Academie des Sciences* started the construction of a small balloon in Paris. This work was entrusted to two brothers by the name of Robert, and to Professor Charles. The ascent was made on August 27, 1783, in the presence of approximately 50,000 spectators.

These ascensions attracted considerable attention and resulted in experiments being made over all of Europe. An interesting description of these events is given in the letters of Benjamin Franklin, who was then in Paris, and a spectator. He suggested applying power.

On November 21, 1783, the first balloon carrying passengers made its ascension near Paris. This balloon, which was made by the Montgolfiers, was much the same as the present-day free or captive balloon.

The British followed Montgolfier and other French

aeronauts and in the early nineteenth century they introduced hydrogen as a gas for balloons. Charles Green is perhaps the premier English balloonist. In 1836 Green contracted to pilot the Great Balloon of Nassau. This titan of the air carried 12 passengers, had a bag of 400,000 cubic feet, and sailed 500 miles from England to Nassau, Germany, in 18 hours. This was by far the most significant air voyage of the time.

In 1863 Nadar built what was then, and probably still is, the largest balloon in history. The *Le Geant* had a bag of 450,000 cubic feet and lifted 40 passengers.

In 1852 Giffard placed a small steam engine in a balloon and flew for a short distance. In 1872 an electric battery motor was devised and placed in a dirigible by DeLomis. In 1884 Renard and Krebs, two French military men, succeeded in propelling an air ship against the wind for the first time.

The Germans began their activity in the last quarter of the nineteenth century. Hamlin contributed a new feature in the gas engine. His ship flew for the first time in 1872. Benzine was also used as a fuel for the first time that year.

By 1875 the shape of the gas bag had developed into the familiar cigar form. Gold-beater skins became universally accepted as the material from which the bladders of the bags should be constructed.

The history of aeronautics is filled with the names of individuals who have dedicated their lives to the cause. Santos-Dumont, a Brazilian living in Paris, perhaps did more to develop the non-rigid dirigible than any other man. He made his first flight in 1898. Santos-Dumont contended year after year for a prize offered to the first aviator to successfully complete a round trip from a Paris field to the Eiffel Tower in thirty minutes. In 1903 he circled the tower and returned to his starting point without trouble. In a decade Santos-Dumont had contributed fourteen ships, each a noticeable improvement upon its predecessors.

The *Le Baudy*, second of the dirigibles constructed by the Le Baudy brothers, met with the French government's approval in 1905. This ship contained the principal fea-

tures of the semi-rigid dirigible of today. The *Le Baudy*, propelled by two motors, flew at a 22 miles-an-hour speed. It formed the nucleus about which was to be built the famous French air fleet.

Great Britain contributed to semi-rigid development by purchase, not by construction. In 1910 the *Clement*, a French-built craft, was taken over by the British Army. It operated at 40 miles per hour. The year 1910 also saw the *Morning Post* purchased by English popular subscription. This ship measured 338 feet in length by 39.4 feet in diameter. Her bag carried 35,000 cubic feet of gas and she carried 20 passengers at 42 miles per hour. Her maiden flight, between the Le Baudy works in France and Great Britain, showed her to be the best accomplishment in the progress of semi-rigid dirigible construction up to the opening of the Great World War in 1914.

Count Von Zeppelin conceived the idea of what was to become known as the "Zeppelin." This lighter-than-aircraft is the evolutionary outcome of the non- or semi-rigid airship—a full rigid. *Zeppelin I* was built in 1900.

The German air-fleet adopted the Zeppelin in 1908, and at the outbreak of the war in 1914 there were 30 Zeppelins in the service of the Empire. In 1912 a new design of the rigid dirigible was brought out by a concern known as the Schutte-Lantz.

It is found to be very impracticable to build non-rigid ships for greater capacities than 1,000,000 cubic feet. One of the largest non-rigid yet built is the British *N. S.*, with 374,000 cubic feet gas capacity, 11.3 tons lift, 58 miles per hour speed, and a 1,500 miles cruising radius.

Semi-rigid airships have reached their best present development in an Italian product. This ship is able to fly 46 miles per hour, remain in the air over 1,600 miles, and can lift 19.1 tons. The container holds 628,000 cubic feet of gas when fully inflated. It is not supposed that satisfactory results could be obtained from a semi-rigid of more than 1,500,000 cubic feet gas capacity.

By far the most important class of lighter-than-aircraft is the rigid or the Zeppelin.

The largest rigid yet built, the German Zeppelin *L70*, completed at the close of the war, has a gas capacity of 2,400,000 cubic feet, lifts 73 tons and can travel 72 miles an hour. It is claimed that this ship will stay in the air for 4,800 miles.

The most celebrated airship trips are those of the *R34*, from England to the U. S. and return in 1919; the German *L59*, which flew from Bulgaria to German East Africa and return during the war; and that of the *ZR3*, from Germany to the U. S.

Since the war the U. S. Navy has built the *ZR1* (*The Shenandoah*), America's first home-made rigid airship. The Zeppelin Company has also built the *ZR3* for the American Navy.

The reparation airship *ZR3*, the 126th airship of the series built by the Zeppelin Company, left Friedrichshafen, Germany, on Sunday morning, October 12, 1924, and reached the naval air station at Lakehurst, N. J., on the following Wednesday morning, having covered the 5,066 miles non-stop flight in 81 hours, 17 minutes. The ship carried a crew of 32, including 4 American observers. On October 16, 1924, the *ZR3* was rechristened *Los Angeles* by Secretary Wilbur.

The length of the *Shenandoah* is 680 feet; diameter, 78 feet; height, 96 feet, and its gas capacity is 2,150,000 cubic feet. The length of the *Los Angeles* is 660.2 feet; diameter, 90.7 feet; height, 101.6 feet; and gas capacity, 2,400,000 cubic feet.—*Extracts, see 13, p. 251.*

History of Heavier-than-Aircraft

Da Vinci, in his "treatise on the bird" written in 1505, expressed the same ideas upon which the modern glider has been built and flown. Borelli explained the theory of flight as a series of leaps through the air.

The year 1675 arrived before any record can be found of even an attempt being made by man to fly. In that year Besnier constructed a flying apparatus which he claimed to have flown as a glider.

By the beginning of the nineteenth century men had flown short distances on gliders. Cayley, often referred to as the father of English aviation, concluded, by 1810, that there must be some mechanical power, some engine, in the machine to make aviation a success. The construction of the plane had been a very simple matter. The building of a light, fast motor was to take almost another century.

In 1849 an Englishman, named Stringfellow, constructed and flew a model airplane under its own power. The machine was driven by a small steam engine. This was the first self-propelled airplane. Stringfellow, hampered by his age and lack of funds, died with his work unrecognized.

Lilienthal took up the development of the glider. The proportionate size of the wings and body of the gliders that he built were planned with reference to the buzzard, the most perfect glider. Lilienthal made over 2,000 glides near Berlin before 1891 when he met his death. He contributed to the science of aviation facts regarding air currents which have permitted the construction of successful aircraft today. One of his contemporaries, Pilcher, an Englishman, deserves study for the size of the glider that he produced and flew. The *Gull* had a wing area of 300 square feet and weighed 55 pounds.

Octave Chanute, the American father of gliding flight, built and flew several full-sized gliders in 1896-97. Chanute introduced the idea of inherent stability.

S. P. Langley began work in 1891 on what he called his "aerodromes." Year after year he tried and failed to make a plane that would support a man and would be propelled by a steam motor. He was willing to give up his work when President McKinley personally requested him to try again, having in mind the military utility of a successful airplane. Langley did try again and his product was a double-biplane, sets of wings in tandem, with motor, a special steam affair, and operator in the center. The screw propeller was used. The wings were of bamboo and linen covering. Due to trouble in taking off, his plane was disabled in its final trial December 8, 1903. Later his ideas were vindicated when Curtiss refitted his plane in 1912 with suitable motive power.

In 1896 Wilbur and Orville Wright became interested in the study of aeronautics. They reached conclusions as to the structure of wings, motive power, balancing and steering before they made any attempt at construction whatsoever. Then in 1900 at Kill Devil Hill in North Carolina, the brothers made their first flights in gliders. These original flying machines were much the same in type as those of Lilienthal and Chanute. By 1902 they had made 1,000 glides and had attained 600 feet as a maximum altitude. By 1903 their gliders were felt to be stable enough to open the consideration of mechanical motive power. The first flight was made at Kitty Hawk, N. C., December 17, 1903, by Orville Wright. He was the first man to fly or travel in an airplane. The flight lasted only twelve seconds, but it was nevertheless the first in the history of the world in which a machine carrying a man had raised itself

by its own power into the air in full flight, had sailed forward without reduction of speed, and had finally landed at a point as high as that from which it had started.

The work of the Wrights was being paralleled in Europe by Louis Bleriot and others.

On September 13, 1906, Santos-Dumont made the first officially recorded European aeroplane flight, leaving the ground for a distance of 12 yards. On November 12 he remained in the air for 21 seconds and traveled a distance of 230 yards.

In 1909 Bleriot introduced the "joy stick" control, making it possible to steer the plane to the right or left and up or down with the same lever. On July 25, 1909, he made the first successful crossing of the English channel. The 20 miles were covered in 37 minutes.

Wilbur Wright had gone to Europe to work out some of his ideas under the patronage of the French. On August 8, 1908, he flew one hour and four minutes with a passenger. This was the duration record then. Orville Wright, on September 12, 1908, made an unsuccessful flight at Fort Meyer, Virginia. In a crash Lieutenant Selfridge, with whom he was flying, was killed. This was the first airplane fatality.

In 1908 Glenn Curtiss flew his first plane, a biplane, from the ice. Curtiss is well known in aeronautics for his contribution to landing devices. His was the first plane to take-off and to land from the water. The first flying-boat was built and flown by Curtiss in 1912.

By the opening of the European war in 1914, Sykorsky, a Russian, had made a height of 300 meters carrying 15 passengers; an English seaplane had flown 130 miles per hour and had climbed 1,400 feet per minute; Linnenkugel,

a German, had reached an altitude of 6,350 meters and Landmann, also in Germany, had made the duration record of 21 hours and 48 minutes.—*Extracts, see 13, p. 251.*

Recent outstanding events in United States military aviation are as follows:

July 15 to October 20, 1920, a successful flight was made by 4 DH4B airplanes from New York to Alaska and return, 9,329 miles.

May 6, 1921, the world's record for altitude, 34,150 feet, was made by Lieutenant J. A. Macready, pilot, and Mr. R. S. Langham, observer, at McCook Field, Dayton, Ohio.

June 16, 1922, Henry Berliner piloted a helicopter at Washington, D. C., proving vertical flight in a heavier-than-aircraft to be possible.

October 18, 1922, Brigadier General William Mitchell established a world's record for speed by flying 224.28 miles per hour in an Army Curtiss Racer.

March 29, 1923, Lieutenant R. L. Maughan, U. S. A., broke the world's record for speed by flying 236.6 miles per hour.

April 17, 1923, Lieutenants O. G. Kelly and J. A. Macready, U. S. A., remained in the air 36 hours and 4½ minutes in a T-2 Monoplane, breaking records for duration at 2,500, 3,000, 3,500, and 4,000 kilometers.

April 17, 1923, Lieutenant H. K. Harris, U. S. A., established a world's record for speed in a DH4L airplane, for 1,500 and 2,000 kilometers.

March 17, 1924, the "Round-the-World" flight was started from Santa Monica, Calif., with 4 Douglas World Cruiser airplanes.

June 23, 1924, Lieutenant R. L. Maughan flew from New

Continued on page 249

Official World Air Records

Recognized by The International Aeronautic Federation, as of April 1, 1925

RECORD	COUNTRY	OPERATOR	DATE	PERFORMANCE
CLASS A (Spherical Balloons)				
1st Category, (600 cubic meters)				
Duration.....	France.....	Cormier.....	Aug. 10-11, 1924.....	22 hrs., 34 min.
Distance.....	France.....	Cormier.....	July 1, 1922.....	804.173 km. (499.69 miles)
Altitude.....	No record.			
2d Category (601-900 cubic meters)				
Duration.....	France.....	Dubois.....	May 14-15, 1922.....	23 hrs., 28 min.
Distance.....	France.....	Cormier.....	July 1, 1922.....	804.173 km. (499.69 miles)
Altitude.....	No record.			
3d Category (901-1200 cubic meters)				
Duration.....	France.....	Dubois.....	May 14-15, 1922.....	23 hrs., 28 min.
Distance.....	France.....	Cormier.....	July 1, 1922.....	804.173 km.
Altitude.....	No record.			
4th-8th Categories, inclusive				
Duration.....	Germany.....	Kaulen.....	Dec. 13-17, 1913.....	87 hrs.
Distance.....	Germany.....	Berliner.....	Feb. 8-10, 1914.....	3052.7 km. (1896.9 miles)
Altitude.....	Germany.....	Suring and Berson.....	June 30, 1901.....	10,800 meters (35,424 feet)
CLASS B (Dirigibles)				
Duration.....	Italy.....	Castracane and Castruccio.....	June 25, 1913.....	15 hrs.
Distance.....	Italy.....	Castracane and Castruccio.....	July 30, 1913.....	810 km. (503.3 miles)
Altitude.....	France.....	Cohen.....	June 18, 1912.....	3080 meters (10,102 feet)
Maximum Speed.....	Italy.....	Castracane and Castruccio.....	July 30, 1913.....	64.8 k. p. h. (40.26 m. p. h.)
CLASS C (Airplanes)				
Duration.....	France.....	Coupet and Drouhin.....	July 16-17, 1924.....	37 hrs., 50 min., 10 sec.
Distance.....	United States.....	Kelly and Macready.....	Apr. 16-17, 1923.....	4050 km. (2516.55 miles)
Altitude.....	France.....	Callizo.....	Oct. 10, 1924.....	12,066 meters (39,586 ft.)
Maximum Speed.....	France.....	Bonnet.....	Dec. 11, 1924.....	448.170 k. p. h. (278.48 m. p. h.)
CLASS C-1 (Seaplanes)				
Duration.....	United States.....	Schur.....	June 12, 1923.....	11 hrs., 16 min., 59 sec.
Distance.....	United States.....	Schur.....	June 12, 1923.....	1275 km. (792.25 miles)
Altitude.....	France.....	Lecoq.....	Mar. 11, 1924.....	8980 meters (29,462 feet)
Maximum Speed.....	Italy.....	Passaleva.....	Dec. 28, 1922.....	280.155 k. p. h. (174.07 m. p. h.)
CLASS D (Glider)				
Duration.....	France.....	Maneyrol.....	Jan. 29, 1923.....	8 hrs., 4 min., 50.4 sec.
Distance.....	France.....	Thoret.....	Aug. 26, 1923.....	8100 meters (26,568 feet)
Altitude.....	France.....	Descamps.....	Feb. 7, 1923.....	545 meters (1787.6 feet)

How United States Air Services Are Organized

The Air Service, U. S. War Department
Bureau of Aeronautics, U. S. Navy Department

Air Mail Service, Post Office Department
National Advisory Committee for Aeronautics

Organization and Policy of the Air Service, U. S. Army

By Mason M. Patrick

Major General, U. S. A., Chief, United States Army Air Service.

THE Air Service of the Army became an entity by the national defense act of June, 1920, in which it was provided that there should be an air service consisting of 1,516 officers and 16,000 men.

Under the War Department the Air Service functions directly under the orders of the Chief of Staff, who reports directly to the Secretary of War; and so far as procurement of equipment is concerned, under the Assistant Secretary of War, whose duty it is made by law to supervise all such activities.

The Air Service itself is organized with the one chief and an assistant chief, and then a number of officers who occupy positions in the technical and other organizations. Due to the decrease which has been made in the total number of officers and men, as prescribed in the national defense act of 1920, the War Department has found it necessary to decrease, more or less proportionately, the different branches. The present authorized branch of the Air Service is 1,247 officers and 8,760 men. The actual strength on the 31st of October, 1924, was 972 officers and 8,705 men.

The Air Service is organized into what are called wings, groups, and squadrons. A squadron in the Air Service really is about the equivalent of a company of infantry. It is practically the smallest organization. Four of these squadrons constitute a group, which might be likened to a battalion or to a regiment in other branches of the service.

There are different types of tactical units or squadrons—the pursuit, observation, bombardment, and attack squadrons. These names indicate quite clearly the particular functions which are performed by the different organizations.

In addition to these technical organizations, there are schools, which are conducted by the Air Service in order to train Air Service personnel. These are primary and advanced flying schools, at which students are placed in order that they may be taught to fly.

There are a number of other schools, such as engineer schools, tactical schools, photographic schools, etc., all in-

tended to train certain portions of the personnel in their specific technical duties.

The Air Service is not only an operating agency in the sense of being a combat arm, but is likewise a supply agency. The Chief of the Air Service, among other things, is charged with the procurement and supply of equipment used by all the air services. And that is one of the most important as well as the most difficult duties which the Chief of the Air Service has to perform.

The Secretary of War laid down to me when I first came into office a policy which I have tried to follow. He stated: It is important that there should be a nucleus of aircraft manufacturers, ready to expand in time of emergency and capable of turning out the number of aircraft which may be needed. The day of air transportation is coming, and in order that there may be manufacturers who can supply the future demand for commercial aircraft as well as the emergency defense requirements, it is essential that these concerns should be kept in business.

Another thing that influenced me, too, was the fact that we can never have in the Army, or in the Military Establishment, a sufficiently large air force to meet what we in the War Department call a major emergency. As with all other branches of the service, we have to go to the citizen reserve in order to supply our emergency needs. Unless there be a commercial flying reservoir, a trained-pilot reservoir, a reservoir of planes, there is nothing upon which we can rely.

In almost all other branches of the Army they deal with rather standardized material. But in aircraft there is nothing of that sort, so the Secretary of War told me to pursue this policy, and endeavor to keep a number of aircraft manufacturers in the field. We have done that quite consistently during the three years that I have been in office.

That means likewise that we have departed somewhat from competitive bidding at many times. It means that we have let contracts to concerns which were not the lowest bidders with the whole intent of carrying out the policy of the Secretary of War of keeping these people alive.

Organization and Work of the Bureau of Aeronautics, U. S. Navy

By William A. Moffett

Rear Admiral, U. S. N., Chief of Bureau of Aeronautics

PRIOR to September 1, 1921, naval aviation was apportioned among the several bureaus of the Navy Department. This interspersion could not bring about close coordination, definite responsibility, or taut cooperation, even with the greatest of individual effort.

Authority for the establishment of the Bureau of Aeronautics is contained in the act making appropriations for the Naval Service for the fiscal year ending June 30, 1922, and for other purposes, approved July 12, 1921. The Bureau was actually created by Navy Department General

Order No. 65, of August 10, 1921, and began to function on September 1, 1921. Aviation in the Navy has been concentrated in one bureau a little over three years.

The duties of the Bureau of Aeronautics comprise all that relates to the designing, building, and fitting out of naval and Marine Corps aircraft, subject to some exceptions noted.

The Bureau of Aeronautics is one of the several bureaus of the Navy Department, and its relation to the Secretary of the Navy is similar to that of all the other various bureaus of the Navy Department. The bureau itself is divided into four principal divisions—administration division, plans division, material division, and flight division.

The administrative division is charged with the allotment of funds; preparation of all records and data relating to appropriations, and the financial questions of the bureau. It is also charged with the dissemination of information.

The plans division looks out mostly for plans affecting war. It is further charged with proposals on the types and military characteristics of all aircraft and special aviation appliances; with recommendations for approval of proposed types and military characteristics; with cooperation in the preparation of sketches, models, data, and other exhibits of a technical nature; with recommendations relative to experimental and development work, new aircraft of each type, and the scope of new construction at shore stations; recommendations on the organization of aircraft units afloat and establishments on shore; recommendations for the distribution of aircraft and the assignment of air station squadrons and detachments; compilation of information and data of a military and technical nature relating to the aeronautic strength of the Navy; recommendations for aircraft planning, final trials of aircraft, and military inspection.

The material division has charge of the supervision of design of aircraft and of material within the cognizance of the bureau; criticism of design; supervision of aircraft research work; cooperation with other bureaus, departments, or organizations of the Government that conduct aeronautic research work; production and procurement of aircraft, maintenance, survey, repair and salvage of aircraft; information and statistics required for efficiency and economy; war-time production; aeronautic experi-

mental work; inspection and tests; naval aircraft factories and experimental stations; helium plants; public works and public utilities at aeronautic shore establishments.

The other division, the flight division, is charged with recommendations for aircraft training; information files of aeronautic experience and qualification of officers; recommendation for details of officers; for the distribution in the various ratings or ranks of enlisted personnel; maintains commissioned or enlisted complement data; preparation for the supervision of operations within the cognizance of the bureau, with the exception of naval aircraft factories or aeronautic experimental stations; technical development; photographic and aerological activities under the cognizance of the bureau.

The activities of the bureau, the operating organization, may be divided into three parts; First, activities afloat; second, activities ashore; and third, Marine Corps aviation. The largest part of the activities are afloat. The activities afloat are all under the command of the commander in chief of the United States Fleet, and more particularly under the command of the three commanders in chief of the Battle Fleet, Scouting Fleet, and Asiatic Fleet.

The primary purpose of the Bureau of Aeronautics is to furnish the fleet with sufficient and proper types of aircraft to carry out the organization as laid down by the Navy Department, and to fulfill the duties which they are called upon to perform. In each fleet there is a commander of the aircraft squadrons, and under him are the aircraft composing the squadrons for the particular organization for which he is responsible.

The activities ashore are under the district commandants, each station being commanded by an officer detailed particularly for that purpose, but responsible to the district commandant.

Marine Corps aviation is administered by a marine officer, who is a member of the plans division of the Bureau of Aeronautics. The Bureau of Aeronautics furnishes the material with which Marine Corps aviation operates, and further is consulted in all recommendations made by the marine officer in charge of the operation of the marine units. The primary purpose of marine aviation is to have a mobile force well equipped and well drilled in expeditionary duties.

Coordinating Agencies of the Army and Navy Air Services

THERE are several coordinating agencies of the Army and Navy air services which are both departmental and interdepartmental. The Navy itself takes charge of any facilities which the Navy already has for administration or for the furnishing of material. For instance, the Bureau of Supplies and Accounts of the Navy handles the contracts for the Bureau of Aeronautics, which also makes use of their machinery and clerical force for the placing of its orders. For ordnance for planes, the Bureau of Ordnance is used.

For all public works at air stations, if there are any buildings, hangars, pipe lines, and sewerage, etc., the people already in the Bureau of Yards and Docks are utilized.

The Medical Corps is used for hospital facilities and for personnel. The Judge Advocate General's Office is used for law questions which come up.

Outside of the Navy Department, the most important coordinating agency is the General Board of the Navy. The General Board consists mostly of line officers of the

Navy, who have had great experience in the Navy. The senior officer is generally the ex-commanding officer of the fleet, and acts as chairman.

The members of the General Board, Navy Department, are as follows:

Members: Rear Admiral H. P. Jones, Chairman; Rear Admiral J. Strauss; Rear Admiral A. T. Long; Rear Admiral W. W. Phelps.

Secretary: Commander W. W. Smyth.

Members (ex officio): Admiral E. W. Eberle, Chief Naval Operations; Rear Admiral C. S. Williams, president Naval War College; Maj. Gen. J. A. Lejeune, Major General Commandant United States Marine Corps; Rear Admiral H. H. Hough, Director Naval Intelligence.

Besides the General Board of the Navy Department, there is the Joint Board. The Joint Board is a board composed of the Chief of Staff of the General Staff of the Army, of which General Pershing was the head until his recent retirement; and the Chief of Naval Operations and his

assistant and several other officers, who constitute the Joint Board and who consult on all matters of national defense. The Joint Board draws up plans for the Army and the Navy and the coast defense.

The Aeronautical Board was founded by joint agreement between the Army and the Navy for the purpose of coordinating as far as possible the activities of the Army Air Service and the Naval Bureau of Aeronautics, with a view to eliminating useless duplication. This board acts in an advisory capacity on technical aeronautical matters to the Joint Board. The Joint Board has the duty of coordinating all activities in all matters of plans, projects, and policies affecting the Army and the Navy. It in turn

makes recommendations to the Secretary of War and the Secretary of the Navy, which if approved by the two Secretaries become effective thereafter as regards the matter at issue.

The National Advisory Committee for Aeronautics, under the law holds itself at the service not only of the War and Navy Departments, but of any department or agency of the Government interested in aeronautics. It furnishes information or assistance in regard to scientific or technical matters relating to aeronautics. The committee may also exercise its functions for any individual, firm, association, or corporation, within the United States, provided that the actual cost involved is defrayed by them.

National Advisory Committee for Aeronautics Organization and Activities

By Dr. Joseph S. Ames

Professor of Physics, Johns Hopkins University, Chairman, Executive Committee, The National Advisory Committee for Aeronautics.

THE National Advisory Committee for Aeronautics was established by act of Congress approved March 3, 1915 (Naval Appropriations Act). It is composed of twelve men appointed by the President. The two chief officials interested in aircraft from the Army, the two chief men from the Navy, the Secretary of the Smithsonian Institution, the Director of the Bureau of Standards, the Chief of the Weather Bureau, and a certain number of men from civil life who are interested in aeronautics. At the present time these men from civil life are Doctor Stratton, the president of the Massachusetts Institute of Technology; Doctor Durand, who is the president of the American Society of Mechanical Engineers; Mr. Orville Wright, the pioneer in aeronautics; and myself.

The functions of the committee as established by law were primarily to undertake investigations dealing with the science of aeronautics; secondly, to give technical and scientific advice to the various services of the country interested in aeronautics, including, of course, the Army and the Navy, and now the air mail; and, thirdly, to distribute information obtained as the results of our own work or as the result of work of others among those who are interested in aeronautics.

The outstanding duties, as they have been developed, in age have been, first, to be of service to the Army and the Navy, and the air mail. And this service is rendered in two ways.

First. We are asked certain specific questions by them for our investigation and for our advice.

Second. We initiate investigations as the result of the work of our several committees, and we carry on our investigations in our own laboratories.

The committee is organized by having a certain number of special subcommittees, one on aeronautics, one on power plants, one on materials.

In addition to those technical subcommittees, there are others, such as publication, information, and so on. Each of these subcommittees consists of a certain number of men from the full committee, and, in addition, the representatives from the Government services and representatives from civil life who are interested in the problem which we have in hand.

All the members of the full committee and of the subcommittees serve the Government without any compensation but each committee is a clearing house of the knowledge which is available in the Government and in civil life on the subjects concerned.

These committees meet regularly at least once a month, and the problems to be undertaken are brought before these committees. The committees may initiate them, or the problems may be referred to them. Then the merits are discussed, and in this way there is absolute coordination of effort on the part of the Government in solving these questions.

The Army and the Navy and all those interested are represented, and it is agreed in the committee as to who it is that shall undertake the specific work.

I think the coordination of effort in this way is unique.

We are asked, of course, from time to time, certain specific questions. When the Navy was interested in the design and the construction of the *Shenandoah* they appealed to us for information. As a result, we carried out for two years and more a long series of investigations on the forces on the airships, and also we appointed a special subcommittee of engineers to discuss with them their theoretical work and to devise means by which the work could be tested in the course of construction.

Everyone now is interested in commercial aviation. The commercial aviation is held back today by the lack of knowledge as to how to make airplanes safe under certain conditions, particularly safety at low speeds. We are engaged on that question today, and have been for some time, and we hope very shortly to be able to answer a great many questions.

As a matter of fact, every piece of information which we place at the disposal of the trade, and at the disposal of the services, is taken advantage of instantly in their new designs. All progress would stop in aviation were it not for the work being done by this committee in obtaining new knowledge as to the theory and as to fact, and also the carrying out of investigations which lie on the border line between pure theory and application.—*Extracts, see 1, p. 251.*

Pioneer Work of U. S. Air Mail Service

By Colonel Paul Henderson

Second Assistant Postmaster General, in charge of Air Mail Service

THE Air Mail Service of the Post Office Department was started as an experiment May 15, 1918, when we were at the height of the war with Germany. Postal officials felt that since a portion of the mails had always gone by the fastest means of transportation, it would be well to learn what advantages were offered by aviation. The route chosen was Washington to New York, a distance of some 240 miles, and the equipment used consisted of obsolete planes lent by the Army Air Service.

The Washington-New York route had been in existence but a short time before the department came to two conclusions. The first was that a civil activity could be more advantageously handled by a civil department, and that the air mail, therefore, should be directed and operated entirely by civilians in the employ of the Post Office Department. The second was that, the two terminals being each about one hour's distance from the centre of the city, so much time was lost in getting to and from the fields that the advantages of air over rail, for the comparatively short distance between the cities of 240 miles, were negligible.

The department, having in mind the great distance separating the Atlantic and Pacific Coasts, determined thereupon to test flying the mails, whenever practicable, from New York to San Francisco. Even at that early day, when the public mind was generally supposed to be obsessed with war problems, the department was put under pressure to extend the air mail.

One such extension, which was ahead of its time, was a north and south lateral connecting Minneapolis and St. Louis via Chicago. But this was abandoned, and, link by link, an air route was born across the continent, touching New York, Bellefonte, Pa., Cleveland, Chicago, Omaha, Cheyenne, Salt Lake City, Reno and San Francisco. By the time I assumed office as Second Assistant Postmaster General, this transcontinental air line had worked itself into daily operation, flying as a series of daylight hops from junction to junction, accelerating a considerable quantity of mail between these points, but carrying no through cargoes.

Any transportation enterprise that can not operate by night as well as by day, upon schedule, has no hope of financial success. And the air mail, unless it could fly by night as well as by day, arriving and departing at fixed hours, might as well be abandoned, so far as being a channel for the development of commercial aviation.

There had been military flying by night, but only under the necessities of war. To attempt a service upon schedule, and, more than all, to ask the public to pay extra for extra speed, was daring. But we in the department felt that we must either go ahead or quit.

The period between April 11, 1921, and August 21, 1923, was occupied with engineering preparation. It required no research to show us that our hope of success lay in attacking the problem from its easiest approach.

Therefore our first night-flying was designated to be in the plains and prairie region between Chicago and Cheyenne, a distance of 885 miles. What happened in

the four days and nights of August 21-24, 1923, is history. Our planes clocked in and out on schedule. Ten beacons and floodlights of 500,000,000 candlepower each, and fifty or more beacons and floodlights of 5,000,000 candlepower each, together with innumerable smaller lights, marked our course with a blaze of light.

After these experimental night flights across the continent, the Postmaster General authorized one month's continuous operation, and Congress appropriated \$2,750,000 for this purpose. We were not ready for this severer task until July 1, 1924, but on the morning of that day one plane left San Francisco at 6:30, and at 10 two left New York. Since then there has been no interruption.

Notwithstanding severe weather conditions in the night-flying division unparalleled within a generation, our schedule was maintained. There were delays, of course, but so far as physical operation is concerned, the air mail has demonstrated its success. This brings us up to another phase, which, in my opinion, is equal in importance to the fact of merely demonstrating that we can fly by night, winter and summer, storm and clear. This phase, in brief, is public patronage.

A great majority of the people today persist in thinking of the airplane as an implement of destruction, not a vehicle of peace; as something extremely costly to construct and therefore to be regarded only as a wartime luxury instead of something for everyday use, and, perhaps what is most unfortunate, as exceedingly dangerous to operate and therefore to be avoided.

Post-war appropriations have not been especially niggardly. Our flying missions have penetrated into Arctic and tropical regions and have circumnavigated the globe. American planes and engines hold all the world's records worth speaking of. And yet the aircraft industry, out of which these brilliant examples of engineering and construction have come, still hovers on the verge of collapse.

The reason, as I see it, is that we must translate patriotic interest into practical patronage. We must, in brief, make it profitable for the public to utilize aircraft for economic purposes; we must put aircraft to work.

When we started the day and night transcontinental air mail we imposed extra charge—8 cents an ounce or fraction thereof for each zone or part of zone traversed by air. The air zones were New York-Chicago, Chicago-Cheyenne, Cheyenne-San Francisco. Our first business was typical of the impression the public hitherto had had of aviation. There were thousands of souvenir post cards, candy, samples, flowers, live chicks, a suit of clothes that cost possibly \$15 and carried \$18 postage—in short, we carried a lot of publicity junk. In the succeeding days, up to about the middle of July, perhaps, our traffic fell off. One by one the curiosity and souvenir letters and cards faded away and the cargo dwindled.

It was then that a policy adopted by the department which has subsequently been proved wise from every standpoint began to make itself felt. We had the alternative of letting the public find out about the air mail itself or of deliberately, for national reasons, informing business

men of the service that had been established and what it would do for them in the way of saving time. Little by little the traffic increased, and as it increased the proportion of personal or obviously freak mail diminished and that of business activities grew. Today our planes, at the peak of the traffic load, which, curiously enough, falls in the exact centre of the transcontinental night flying section, are between 75 and 80 per cent loaded, and the weight is steadily increasing.

Banking mail predominates. The reason is apparent. To the banker, more than to any other business man, time is money. The Federal Reserve Bank in its various branches, and, without exception, all the larger financial institutions in New York, Cleveland, Chicago, Omaha, Cheyenne, Denver, Salt Lake City, Reno, Los Angeles, San Diego and San Francisco, are heavy users. Collections via air mail, whereby transportation time is cut from five days to two, means the saving of enormous sums in actual interest and the release of untold millions in "float," or money credits which are tied up in the mails and which while tied up are practically non-existent.

The banker is not afraid to use the air mail. Why should he be? He knows that in the last two years and ten months—or practically the period we have been endeavoring to put the air mail to real use—our planes have flown well over 6,000,000 miles; that they have carried in this time in excess of 2,050 tons of mail, and that out of these 2,050 tons only 125 pounds have been destroyed. Or, figuring forty letters to the pound, out of probably 160,000 pieces of mail fewer than 5,000 have been lost. This truly remarkable record of efficiency and safety has impelled insurance companies, so the department is informed, to impose on air mail precisely the same rates as those placed on the older established surface means of transportation.

After the bankers in the line of patronage come the transportation and shipping people. The great steamship companies have much correspondence passing between the ports of the Atlantic and Pacific Coasts, and this correspondence, so many companies inform us, is traveling by air.

Import and export houses, manufacturing concerns doing a nation-wide business, publishers, advertising agencies—any business, in fact, whose territory has a radius of 500 miles or more—are regular patrons of the air mail.

The New York and San Francisco post offices, aware of this important part of the traffic, coordinate their distribution with steamship sailings, and in this manner save many days—sometimes weeks.

The operation of air mail service during the fiscal year ending June 30, 1924, was confined to one transcontinental route from New York to San Francisco. The total length of the route is 2,680 miles. The trip west, New York to San Francisco, is made in 34 hours and 45 minutes, and includes 15 stops. The trip east includes 14 stops and is made in 31 hours and 35 minutes.

The appropriation for the year for the service was \$1,500,000; the expenditures were \$1,495,996.33.

During the year a total of 1,853,251 miles was flown by air mail planes carrying an estimated total of 60,001,360 pieces of first-class mail. A performance percentage of 95.75 per cent was made for the year's operation.

On June 30, 1924, the air mail service had 74 planes in flying condition. There were employed in the air mail service 45 pilots and approximately 225 mechanics, field service men, and clerks, making a total personnel of 600.

The initial move in what is generally considered to be the most forward step in commercial aviation in this country

was taken on April 13, 1925, when Postmaster General New issued regulations governing the letting of contracts to transport mail by air, carrying out recent legislation in which the Postmaster General is authorized to contract for air mail service.

Department officials and air mail enthusiasts throughout the country are in accord in the belief that the operation of the new law will place America on a par with commercial aviation abroad which in most cases is heavily subsidized by the various European governments.

Under the law, in addition to mail, contractors on air mail routes will be permitted to transport passengers, express packages, and freight. The Act authorizes postage rates of not less than 10 cents an ounce or fraction thereof and provides that not less than four-fifths of the total postage derived may be paid to the contractor.

The first step in bringing contract air mail routes into existence will originate with postmasters who by petition showing the need for the establishment of contract air mail routes between different cities will call the attention of the Post Office Department to such routes. The Postmaster General after considering the petitions will advertise for bids in his discretion.

Three major requirements will be kept in mind in the awarding of contracts—first, reliability and responsibility of bidders; second, flying equipment, and third, flying experience of the organizations.

Contractors must be American citizens and corporations must furnish evidence to show that at least 75 per cent of the company's stock is American owned. Only aircraft manufactured in the United States may be used. Location of landing fields will be subject to approval by local postmasters and the Post Office Department.

Each contractor must obligate himself to the government for faithful performance, either by personal surety or acceptable bond for not less than \$10,000 on each contract.

Such land light houses, emergency landing fields, radio stations, other means of communication, and other aids to navigation as may be necessary for the proper navigation of aircraft of these contractors, must be provided for by the contractor.

Only air mail having special air mail postage affixed will be carried on the contract routes. Special postage rates for the service will be 10 cents for each ounce or fraction thereof on routes of 1,000 miles or less; 15 cents on routes over 1,000 miles and less than 1,500 miles; and 20 cents on routes over 1,500 miles, direct air mileage to control in each case.

Opening of several new air mail routes linking some of the more important cities is being considered by Postmaster General New. Some of the new links will be put in operation probably this summer, in connection with the present transcontinental air mail service.

Inauguration of an overnight air mail between New York and Chicago, which is a major item in the program, within a month or so, will be the first step in the expansion of the world's greatest regular air route.

Extensions now under consideration include routes between:

New York and Boston, Chicago and St. Louis, Los Angeles and Salt Lake City, Elko, Nev., and Pasco, Wash., Minneapolis-St. Paul and New Orleans via St. Louis and Memphis, Pittsburgh and New Orleans, and Chicago and New Orleans via Indianapolis, Louisville, Nashville and Birmingham.

The routes between New Orleans and the Northern cities would operate independent of the transcontinental service.

Cost of United States Air Services

*Estimated Cost of the Air Service of the United States, including Army, Navy, Post Office, and the National Advisory Committee for Aeronautics, fiscal years 1920-1924, inclusive.**

	1924	1923	1922	1921	1920	Total
Army:						
Expenditures from direct appropriations to Air service, including salaries, O. C. A. S.	\$13,263,497	\$12,867,306	\$18,055,023	\$32,332,907	\$25,882,153	\$102,400,887
Expenditures from indirect appropriations—						
Signal Corps	530,575	162,000	825,000	160,000	250,000	.....
Medical Department	69,957	89,261	64,386	73,153	90,448	.....
Ordnance Department	508,390	667,854	681,230	599,593	892,647	.....
Chemical Warfare Service	19,461	8,604	4,061	3,720	161	.....
Quartermaster Corps	4,477,281	4,075,654	3,459,336	5,192,359	8,886,226	.....
Corps of Engineers	6,501	60,978	25,651	.....	.....	.....
Pay of the Army	8,272,720	7,985,424	9,380,905	8,705,331	9,156,264	.....
Mileage of the Army	43,106	34,382	48,337	75,251	174,737	.....
Total	\$13,927,993	\$13,084,159	\$14,488,907	\$14,809,409	\$19,450,484	75,760,955
Value (estimated) of issues from war surplus (war cost)	\$12,758,555	\$10,389,811	\$15,000,000	\$15,000,000	\$15,000,000	68,148,366
Total	39,050,046	36,341,277	47,543,931	62,142,316	60,332,638	246,310,209
Post Office	\$1,473,932	\$1,852,524	\$1,420,706	\$2,469,483	\$850,406	8,067,052
National Advisory Committee on Aeronautics	\$300,609	\$214,151	\$193,859	\$199,210	\$174,296	1,082,126
Navy:						
Expenditures from direct appns. for aviation purposes	14,544,877	14,655,345	\$15,143,830	\$17,383,967	\$22,530,319	84,258,339
Expenditures from indirect appropriations—						
Printing and binding	10,000	10,000	.....	.....	.....	.....
Salaries, Navy Department	143,367	116,708	.....	.....	.....	.....
Pay, Navy	6,817,753	6,774,134	.....	.....	.....	.....
Pay, Marine Corps	636,257	666,965	.....	.....	.....	.....
Provisions, Navy	657,346	854,669	.....	.....	.....	.....
Provisions, Marine Corps	134,900	131,765	.....	.....	.....	.....
Ordnance and ordnance stores	206,192	300,000	.....	.....	.....	.....
Bureau of Engineering	250,254	266,630	10,000,000	10,000,000	10,000,000	.....
Bureau of Construction and Repair	123,405	343,301	.....	.....	.....	.....
Naval Reserve Force	377,000	137,322	.....	.....	.....	.....
Maintenance, Supplies and Accounts	129,558	240,000	.....	.....	.....	.....
Medical Department	50,000	50,000	.....	.....	.....	.....
Transportation, Navy and pay, miscellaneous	169,795	86,000	.....	.....	.....	.....
Fuel and transportation	245,332	12,600	.....	.....	.....	.....
Total	9,951,165	9,990,095	.....	.....	.....	49,941,207
Value (estimated) of issues from war surplus (war cost)	3,000,000	10,724,297	10,000,000	10,000,000	10,000,000	43,724,297
Total	\$27,496,042	\$35,369,738	\$35,143,830	\$37,383,967	\$42,530,319	177,923,898
Grand total	69,220,630	73,777,690	84,302,327	102,194,977	103,887,660	433,383,287

*This statement is a tabulation of the estimated cost of the Air Service of the United States, including the Army, Navy, Post Office, and the National Advisory Committee on Aeronautics, for the fiscal years 1920 to 1924, inclusive. This tabulation was made, not as a result of original research into those costs, but merely a compilation of costs quoted in various documents. The accuracy of the costs is limited as indicated by the footnotes which appear at the bottom of the tabulation.—Submitted January 27, 1925, to U. S. House Select Committee of Inquiry into Operations of U. S. Air Services (Hearings, p. 1561), by Major Walsh, Chief of the Finance Section, Office of Chief of Air Service, U. S. Army.

¹ Prepared by Chief of Finance, War Department, for hearings, Appropriations Subcommittee, House of Representatives, fiscal year 1926.

² Statistical Section, General Staff, Nov. 28, 1924.

³ Chief of Finance to Chief of Staff, July 28, 1924.

⁴ Records of cost of Air Service not available. Costs shown based on percentage of Air Service to total strength of Army.

⁵ Statement supply group, O. C. A. S., Nov. 27, 1924.

⁶ Report, supply group, see C. A. S. letter to Chief of Finance, Sept. 27, 1924.

⁷ Value not known and this value assumed.

⁸ From the Budget.

⁹ From hearings, Post Office Department, fiscal year 1923, p. 284.

¹⁰ Hearings, Navy Department, fiscal year 1926, p. 589.

¹¹ Cost not known. The figures used are based on cost for same items included for the fiscal year 1923 in statement of Admiral Moffett, Hearings, Navy Department, fiscal year 1925, p. 525.

¹² Hearings, Navy Department, fiscal year 1925, p. 525.

¹³ Hearings, Navy Department, fiscal year 1926, p. 590.

Note.—Langley pay and operation not included in above.

Aeronautical Activities in Federal Departments

Department of State

THE Secretary of State is the custodian of international air navigation treaties. Our flying relations with Canada, the international air convention and the aircraft, including the *Los Angeles*, which came to us as reparation, have brought his office in touch with international aeronautics.

The Consular Service.—Information on foreign trade possibilities in aircraft and developments in commercial and governmental aeronautics in foreign lands is brought to American aircraft manufacturers through this branch of the department.

Department of Justice

The Attorney General represents the Government in any cases which may come before the Supreme Court of the United States and the Court of Claims, where suits involving aircraft patents, and governmental contracts are brought.

Post Office Department

The Postmaster General is the executive head of the Federal postal service, including the Air Mail. For an account of the Air Mail Service see page 225.

Department of Commerce

The Secretary of Commerce is charged with the work of promoting commerce and mining, manufacturing, shipping, fisheries and transportation interests. Aircraft enter into all of these endeavors.

The Bureau of Foreign and Domestic Commerce through its attachés abroad studies possibilities of foreign markets for American goods and the information is made available in Commerce Reports. Data on our imports and exports—including aircraft—are obtainable here.

The Bureau of Standards has, from the beginning of flying, been concerned in the development of the technical side of aeronautics from almost every possible angle. The Bureau of Standards is in contact with flight in every new record that is established by aircraft in this country.

The Bureau of Fisheries has studied the airplane in connection with the development and control of commercial fisheries and practically demonstrated the use of the airplane.

The Bureau of Lighthouses is not yet directly concerned in the use of aircraft in its work but the lighthouse is of prime importance to air navigation.

The Coast and Geodetic Survey is charged with the survey of the coasts of the United States and possessions. Airplanes have been used successfully in mapping land areas and have been found especially efficient in revising and correcting charts for shoreline changes.

The Bureau of Navigation is generally charged with superintendence of the commercial marine, including the registry and license of vessels. Seaplanes have been considered within the Bureau's jurisdiction and regulations have been applied in a number of cases.

The Patent Office has to do with aeronautic patents and their number runs to scores of thousands.

The Steamboat Inspection Service is charged with the duty of inspecting vessels and the licensing of pilots and officers. The seaplane has likewise come within the consideration of this bureau and more than one aviator has

held a steamboat license and had his plane inspected for equipment.

Department of Agriculture

The Secretary of Agriculture is charged with the promotion of agriculture in the broadest sense. The airplane and the airship have already been employed by the Department of Agriculture to a greater extent than in any other purely civil branch of the Government, except the Post Office.

The Weather Bureau undertakes weather forecasts, flood and weather warnings, collection and transmission of intelligence for the benefit of commerce and navigation; meteorological and aerological studies, etc. This bureau is of vital importance to aeronautics.

Forest Service.—The Forest Service administers the national forests. Fire protection is important. Airplanes of the Army were used for forest fire patrol for a number of years but have now been discontinued for lack of funds.

The Forest Products Laboratory is interested in research into the properties and uses of woods. In the development of airplane structures, the Laboratory has been of inestimable value to the airplane industry.

The Bureau of Entomology studies insects in their economic relation to agriculture. The aircraft is an insecticide machine. Extensive war has been conducted by air against the boll weevil and other pests.

The Bureau of Agricultural Economics, among other duties, handles crop reporting. This has already been done by airplane observation and photography.

Department of the Interior

The Geological Survey is principally engaged in the mapping of the United States. The airplane has been employed experimentally but with good results by the Survey.

The Bureau of Mines studies methods and safety in mining. The airplane has been used in the aid of the rescue of miners. This bureau administers the regulations governing the production of coal, oil, gas and phosphate from lands mined under government lease. To the aeronautic world it is best known for its work in the production of helium and in the mapping of Teapot Dome by air.

Department of the Treasury

Commissioner of Internal Revenue. Aircraft entering the United States from foreign lands must comply with regulations similar to those for any other common carrier.

Public Health Service. Aerial immigrants must undergo medical examinations by this service.

The Coast Guard—a part of our military forces in time of war—renders assistance to vessels or seaplanes in distress.

War Department

The War Department gave the first governmental order for an airplane with the order for the Wright machine in 1908.

The General Staff is the immediate adviser of the Secretary of War and prepares war plans and considers how, when and where the air service of the Army will be employed with the Cavalry, Field Artillery, Coast Artillery, Infantry, Chemical Warfare Service and the Engineers.

Field Artillery. From the first use of balloons in American warfare in 1861, balloons and airplanes have

cooperated with the artillery. *The Infantry* has been familiar with aircraft for the same period.

The Chemical Warfare Service is a comparatively new arm. It is concerned with the development of toxic and other gases and smokes and incendiary material. The development of this type of war munition has brought into consideration its use by aircraft. The Army Air Service and the Chemical Warfare Service have been working for several years in an experimental way. The work of the C. W. S. has also shown the application of gases and smokes to life and industry. In the application of these chemicals to agriculture the airplane plays an important part.

The Engineers handle the work ordered by Congress on rivers and harbors, administration of certain laws governing navigable waters, establishment of harbor lines, anchorage grounds, power projects, certain surveying and mapping. Much of the Engineers' work has been done in cooperation with the Army Air Service.

The Ordnance Bureau has to do with the armament of the field service. It is concerned with the armament of aircraft but does not operate aircraft for its own purposes.

The Signal Corps has charge of the development of all signal equipment, meteorological and other instruments used in connection with aircraft in peace and war but this bureau no longer operates aircraft.

The Chief of Air Service is the only War Department bureau chief operating aircraft. The C. A. S. is charged with the manufacture, purchase, maintenance and operation of all aircraft and appurtenances, including all radio and signaling within Air Service activities. The Army Air Service is one of the three operated by the Government. Wherever airplanes or airships and balloons have been used by other branches of the Government, they have been furnished by either the Navy or Army air services. For an account of the U. S. Air Services, see page 222.

Navy Department

The Navy's activities in aeronautics are centered in the

Bureau of Aeronautics of the Navy and in the Marine Corps. The chief of the Bureau of Aeronautics controls the design, construction, equipment; maintenance of naval and Marine Corps aircraft; upkeep and operation of naval aircraft factories, naval aeronautic experiment stations and naval helium plants. The experimental and test work of other bureaus of the Navy Department, such as Ordnance, is made in accordance with requests of the Bureau of Aeronautics. The organization of the Bureau of Aeronautics is described on page 222.

The National Advisory Committee for Aeronautics

The duties of the National Advisory Committee for Aeronautics include the supervision and direction of the scientific study of the problems of flight with a view to their practical solution, determination of the problems which shall be experimentally attacked and the conduct of researches. The organization of the National Advisory Committee is described on page 224.

Smithsonian Institution

"Among other things, the Smithsonian Institution has the custody of aeronautic material representing the progress of the art. For more than three score years it has been active in aeronautics. It encouraged three attempts to cross the Atlantic by air and its officers were largely responsible for the use of balloons in the Civil War and for the experiments of Langley.

Joint Army and Navy Board

The Joint Army and Navy Board is designed to "secure complete cooperation and coordination in all matters and policies involving joint action of the Army and Navy relative to the national defense." See article on page 223.

The Aeronautical Board

This board, like the Joint Board, is appointed by the Secretary of War and the Secretary of the Navy. As its name indicates it is concerned solely with aeronautics and is designed to prevent duplication and to secure coordination between the Army and Navy air services. See article on page 223.—*Extracis*, see 11, p. 251.

How Air Forces in Other Countries Are Organized

British Empire Air Force

Great Britain

IN May, 1912, the Royal Flying Corps first came into existence. It was then divided into two wings, the Royal Naval Air Service and the Royal Flying Corps, administered by the Admiralty and War Office respectively, while a joint Air Committee was formed, consisting of representative of both services, to secure cooperation. The powers of this body were limited, and it failed to secure its object. A second Committee, formed in February, 1916, was equally unsuccessful. It was followed by an Air Board in May, 1916, and by a second Air Board in January, 1917. Both of these had inadequate powers.

On January 2, 1918, an Air Ministry was formed, and the control of the Royal Air Force was vested in an Air Council analogous to the Army Council. The Air Minister was given the status of a Secretary of State and became President of the Council. In April, 1918, the naval and military wings were amalgamated, under the Ministry of the Air, as the Royal Air Force.

The Air Force is administered by the Air Council, which is composed of the Secretary for Air, who is President,

the Under-Secretary for Air, who is Vice-President, the Chief of the Air Staff, the Director-General of Supply and Research, the Air Member for Personnel, and the Secretary of the Air Ministry. Under the direction of the Secretary for Air, the Under-Secretary for Air is responsible for finance, for civil aviation, and the control of landed property of the Ministry. The Chief of the Air Staff is responsible for plans of operations, for the collection and distribution of intelligence, and for the training and organization of the Air Service. The Director-General of Supply and Research is responsible for design, research, armament, the supply of aircraft, and aeronautical inspection. The Air Member for Personnel is responsible for recruiting, discipline and medical services.

The Force consists of the Royal Air Force, the Air Force Reserve, the Auxiliary Air Force and the Territorial Air Force. The establishment of the Royal Air Force for the year 1924-25 is 35,000, exclusive of those serving in India, who are paid for by the Government of India. The Air Force is organized into commands as follows:

United Kingdom: (a) Inland Area (b) Coastal Area (c) Irish Wing (d) Cranwell (e) Halton.
Overseas: (a) Middle East Area (b) Iraq (c) India (d)

British Empire Air Force—continued

Mediterranean (e) Rhine (f) Palestine.

Areas are subdivided into groups and wings, a certain number of squadrons being allotted to each group or wing. Squadrons are subdivided into flights.

At the end of 1923 the Royal Air Force maintained 39 squadrons, each of 12 aeroplanes; 22 squadrons were in Great Britain and 17 abroad.

The chief educational establishments of the Air Force are the Cadet College at Cranwell and the Staff College at Andover.

The Air Estimates for 1924-25 were gross 19,257,400 pounds; appropriations in aid 4,879,400 pounds; net 14,378,000 pounds.

The Director of Civil Aviation is responsible for the control and development of civil aviation, and for the organization of air routes and for meteorological information. During 1924-25 the sum allotted to civil aviation was 355,000 pounds. The air routes maintained were London-Manchester, London-Amsterdam, London-Brussels-Cologne, London-Paris.

India

The Royal Air Force in India comprises 6 squadrons organized in 2 wings of 2 squadrons each; the remaining squadrons, the Aircraft Depot and Aircraft Parks are directly under R. A. F. Headquarters, India.

France

Four government agencies are concerned with aeronautical questions in France, viz., the *Ministère des Travaux Publics*, who controls a *Sous-Secrétariat de l'Aéronautique et des Transports Aériens*, the *Ministère de la Guerre*, the *Ministère de la Marine*, and the *Ministère des Colonies*.

The *Sous-Secrétariat de l'Aéronautique et des Transports Aériens* was established in January, 1920. The *Sous-Secrétariat* is charged with the responsibility for the technical progress of French aeronautics, with the command of all aeronautical matériel used by the Army, the Navy, and in the Colonies, and with the control of all matters relating to civil aerial navigation. In this he is aided by the Technical Aeronautical Service, the Service of Aeronautical Manufacture and the Service of Aerial Navigation. The *Sous-Secrétariat* has annexed the old *Bureau Central Météorologique*, reorganizing it as the *Office National de Météorologique*.

For administrative purposes there is established in the *Sous-Secrétariat* a cabinet, a chief of service, and four bureaux as a nucleus of executive control.

Military Aeronautics

The Direction of Military Aeronautics, or XII Direction, takes charge of all aeronautical questions in the Ministry of War. At the head of the Direction, not related to it but to the Ministry of War directly, is the Inspectorate General of Military Aeronautics, which was organized in 1921, and whose duty it is to keep the Minister of War, the Superior War Council, and the Chief of Staff informed on the general situation of military aeronautics, especially needs and progress.

The organization of the XII Direction comprises: (a) the Technical Inspection Service (b) the General Replacement of Aviation Matériel Direction (c) the Central Warehouse of Matériel for Military Aeronautics (d) the Schools (e) the Service for Military Meteorology, and (f) a Center for Aeronautical Research. The Technical Inspection

Service controls the functioning from the technical viewpoint of the military aeronautical establishments and groups. It maintains constant liaison with the Technical Aeronautical Service of the *Sous-Secrétariat*. The General Replacement Direction coordinates the various supply depots and warehouses of aviation matériel, and regulates the procurement of all aeronautical matériel except that for colonial aeronautics. The Central Warehouse supplies matériel of any kind to aerostation units.

France today has but one military school which trains air pilots, viz., that at d'Istres (Bouches-du-Rhône). Training at certain civil schools is, however, recognized by the Minister of War.

The chief of the Meteorological Service is also head of the National Office of Meteorology, and there exists perfect liaison between the two services.

Naval Aeronautics

Before 1914 naval aeronautics could not be said to have existed in France. During the war the Minister of Marine created a *Service de l'Aéronautique*, the organization of which was inspired by the military aeronautical service.

A *Service Central de l'Aéronautique Maritime* exists, in charge of a *contre-amiral* of the Navy. This Service has charge of naval aviation and aerostatics, but cannot pass on problems touching tactics of navy personnel. In these cases the Chief of Staff of the Navy and the Director of Personnel must be consulted. A condition is imposed on officer pilots in naval aeronautics which has no counterpart in military aviation; these officers, who are only detached for the *Service de l'Aéronautique*, may remain there only for a certain period, after which they are obliged to return to sea service.

For all technical matters and for the purchase of material solely for aviation, the *Sous-Secrétariat d'Etat* must be appealed to.

The Research Center functions at Versailles.

The military aeronautical organization consists of regiments composed of squadrons and groups. These regiments are numbered as follows: *Régiments de chasse*, 1 to 10; *régiments de bombardement de jour*, 11 to 20; *régiments de bombardement de nuit*, 21 to 30; *régiments d'observation*, from 31 on.

Italy

By Royal Decree of April, 1923, the Italian Royal Air Force is constituted as a separate force under a High Commissioner for Aviation. Detachments of the Royal Air Force doing duty with the Army and Navy are for the time under the control of these services.

The expenditure for 1923 was estimated at 280,000,000 lire. The number of airplanes in possession of the Air Force was 1,000, of which about 650 were available for active employment. It is proposed to increase this number to 4,500, of which 1,500 will be with the active force, 1,500 in second line, and 1,500 in third line. The Royal Air Force is organized in aerial squadrons and divisions.

Japan

Naval aviation in Japan is organized on lines very similar to those in the United States Navy.

There are 6 aero battalions and 1 balloon corps in the active army. The air personnel for army and navy in 1923 numbered 6,156, and the number of aircraft was 548. There were 4 naval flying corps possessing about 200 various machines.—*Extracts, see 10, p. 251.*

A Glossary of Aeronautical Terms

Prepared by Information Section, Office of Naval Intelligence

Aircraft: Any man-carrying device or structure designed to be supported by the air, making use either of buoyancy or of the dynamic action of the air.

Aircraft Carriers: Aircraft carriers are vessels designed to carry large numbers of all types of scouts, combat planes, bombers, and to facilitate the landing and taking off of planes from the deck of the ship. Large stowage spaces are provided in which planes may be stowed below decks and facilities are provided in the way of shops for overhaul and repair of aircraft and engines.

Aerodrome: The ground from which flying experiments are made.

Catapult: A device for launching an airplane from the deck of a ship.

Hangar: A shelter for housing aircraft.

Mooring Mast: A mast or tower at the top of which there is mounted a fitting so that the bow of an airship may be secured. It is usually provided with a ladder or staircase and a platform at the top so that crew and passengers may enter or leave the airship, and also with piping for the supply of fuel, gas, and water.

Parachute: An apparatus used to retard the descent of a falling body by offering resistance to its motion through the air. It is usually made of light fabric, so that it may be packed in a small space in such a manner that it will readily unfold when released with a falling body attached.

Lighter-than-Aircraft: Applied to aircraft which use gas for power of ascension.

Aerostat: An aircraft whose support is chiefly due to buoyancy, its interior being occupied in the main by one or more bags or cells filled with a gas lighter than the surrounding air. (Same as lighter-than-aircraft.)

Airship: An aerostat provided with a propelling system and with means of controlling the direction of motion. If its power plant is not operating, it acts like a balloon. The present term "airship" is usually applied to "dirigible balloons." The principal feature of all airships is their means of buoyancy. The ship must be sustained by a gas that is lighter than air. The specific gravity of air is 1.0000; of helium, .1378; and of hydrogen, .0695. Helium and hydrogen are the only gases used to any extent in airships at the present time. The lifting power of hydrogen is 70.746 pounds per 1,000 cubic feet of gas compared with helium, which lifts 65.57 pounds for the same volume. The advantage of hydrogen lifting power is much more than offset by the fact that hydrogen under certain conditions is highly inflammable, while helium will not burn.

Ballonet: A chamber constructed of fabric within the interior of a balloon or airship for the purpose of controlling the ascent or descent by altering the aerostatic relations and for maintaining the pressure of the gas in the envelope so as to prevent deformation. The ballonet is kept inflated with air at the required pressure, under the control of valves, by a blower or by the action of the wind caught in an air scoop.

Non-rigid: An airship whose form is maintained by the internal pressure in the gas bags and ballonets.

Rigid: An airship whose form is maintained by a rigid structure.

Semi-rigid: An airship whose form is maintained by

means of a rigid or jointed keel in combination with internal pressure in the gas containers and ballonets.

Balloon: An aerostat the form of which is maintained by the pressure of a contained gas lighter than the surrounding air, and which has neither power plant nor means of controlling the direction of flight in a horizontal plane.

Barrage*: A small captive balloon, used to support wires or nets which are intended as a protection against attacks by airplanes.

Captive: A balloon restrained from free flight by means of a cable attaching it to the earth.

Free: A balloon, usually spherical, whose ascent and descent may be controlled by use of ballast or with a loss of the contained gas, and whose direction of flight is determined by the wind.

Kite: An elongated form of captive balloon, fitted with lobes to keep it headed into the wind, and usually deriving increased life due to its axis being inclined to the wind.

Nurse*: A small balloon made of heavy fabric, employed as a portable means for storing gas.

Pilot*: A small balloon sent up to show the direction and speed of the wind.

Sounding*: A small balloon sent up without passengers but with recording meteorological instruments.

Heavier-than-Aircraft: A term applied to all aerial vessels whose ascensional power is not derived from gas.

Aviation: The art of operating heavier-than-aircraft.

Aeroplane (airplane): A mechanically driven heavier-than-aircraft, fitted with fixed wings and supported by the dynamical action of the air.

Helicopter: A form of heavier-than-aircraft whose chief support in the air is derived from the vertical thrust of propellers.

Glider: A form of aircraft similar to an airplane, but without a power plant.

Gyroplane: A form of aircraft with rotating wings.

Types of Airplanes

Monoplane: An airplane which has but one main supporting surface, sometimes divided into two parts by the fuselage (the streamline structure containing the power plant, etc.).

Biplane: An airplane with two main supporting surfaces, placed one above another.

Triplane: An airplane with three main supporting surfaces, placed one above another.

Quadruplane: An airplane with four main supporting surfaces, placed one above another.

Multiplane: An airplane with two or more main supporting surfaces, placed one above another.

Seaplane: An airplane designed to rise from and alight on the water. A boat seaplane (flying boat) is a form of seaplane having for its central portion a hull or boat which provides flotation in addition to serving as a fuselage. It is often provided with auxiliary floats or pontoons for lateral support on the water. A float seaplane is a form of seaplane with one or more floats or pontoons instead of a hull.

(*Those forms of balloons marked with an asterisk are not, strictly speaking, aircraft.)

Continued on page 251

Proposal to Create a Department of Aeronautics

Legislative History of Proposals to Establish Separate Department

Sixty-fourth Congress. First Session

March 28, 1916. H. R. 13838—A bill to establish a department of aviation, etc. Introduced by Mr. Lieb, Indiana, D., and referred to the House Committee on Military Affairs.

Sixty-fifth Congress. First Session

April 2, 1917. H. R. 3—A bill to establish a Department of Aeronautics, etc. Introduced by Mr. Hulbert, New York, D., and referred to the House Committee on Military Affairs.

April 4, 1917. S. 80—A bill identical with the House bill (H. R. 3). Introduced by Mr. Sheppard, Texas, D., and referred to the Senate Committee on Military Affairs.

June 12, 14, 18, 20, 29, 1917. A Subcommittee of the Senate Committee on Military Affairs held hearings on the bill (S. 80, Sheppard, Tex., D.) to establish a Department of Aeronautics, etc. The Subcommittee consisted of Senators Sheppard (Chairman); Beckham, Ky., D.; Kirby, Ark., D.; Brady, Ida., R.; and Sutherland, W. Va., R.

Sixty-fifth Congress. Second Session

August 1, 1918. S. 4852—A bill to create an executive department in the Government to be known as the Department of Aeronautics, and for the appointment of a Secretary of Aeronautics, etc. Introduced by Mr. New, Ind., R., and referred to the Senate Committee on Military Affairs.

September 17, 1918. Mr. New from the Committee on Military Affairs reported the bill (S. 4852) with amendments. (S. Rept. 570.)

Sixty-fifth Congress. Third Session

February 28, 1919. H. R. 16195—A bill to create a department of air service. Introduced by Mr. Lundeen, Minn., R., and referred to the House Committee on Interstate and Foreign Commerce.

Sixty-sixth Congress. First Session

July 28, 1919. H. R. 7925—A bill to establish the Department of Aeronautics. Introduced by Mr. Curry, Calif., R., and referred to the House Committee on Military Affairs.

July 31, 1919. S. 2693—A bill to create a department of aeronautics, defining the powers and duties of the director thereof, etc. Introduced by Mr. New, Ind., R., and referred to the Committee on Military Affairs.

October 8, 1919. H. R. 9804—Mr. Curry reintroduced his bill which was referred to the House Committee on Military Affairs.

October 30, 1919. S. 3348—Mr. New reintroduced his bill, which was referred to the Committee on Military Affairs. (See below under date of December 8, 1919.)

November 5, 1919. H. R. 10380—A bill to create a Department of Aeronautics, etc. Introduced by Mr. Hull, Iowa, R., and referred to the House Committee on Military Affairs.

Sixty-sixth Congress. Second Session

December 8, 1919. Mr. New, from the Senate Committee on Military Affairs reported favorably with amendments (S. Rept. 325) the bill (S. 3348) to create a Department of Air, etc. The Committee reported in part that "on July 31, 1919, the bill (S. 2693) was referred to the Committee and for the succeeding three months it was the subject of almost daily hearings, at the end of which time the bill (S. 3348) was substituted for the former bill (S. 2693) in conformance with conclusions reached by the committee as the result of its hearings. The hearings were continued until the adjournment of the First Session, November 19, 1919."

December 15, 1919. H. R. 11206—A bill to create a department of aeronautics, defining the powers and duties of the director thereof, etc., was introduced by Mr. Morin, Pa., R., and referred to the House Committee on Military Affairs.

January 28, 1920. Debate was begun on the bill (S. 3348) and was continued on January 29 and January 30. On January 31 the

bill was recommitted to the Senate Committee on Military Affairs, at the request of Mr. New.

January 29, 1920. H. R. 12134—A bill to create a department of aeronautics, etc. Introduced by Mr. Hull, Iowa, R., and referred to the House Committee on Military Affairs.

Sixty-sixth Congress. Third Session

February 24, 1921. H. R. 16151—A bill to create a department of aeronautics, defining the powers and duties of the secretary thereof, etc. Introduced by Mr. Curry, Calif., R., and referred to the House Committee on Military Affairs.

Sixty-seventh Congress. First Session

April 15, 1921. H. R. 3718—A bill to create a department of aeronautics, defining the powers and duties of the director thereof, providing for the development, production, operation, and maintenance of aircraft, and providing for the development of civil and commercial aviation. Introduced by Mr. Morin, Pa., R., and referred to the House Committee on Military Affairs.

April 19, 1921. H. R. 4395—To create a department of aeronautics, defining the powers and duties of the secretary thereof, providing for the organization, disposition, and administration of a United States Air Force, and providing for the development of civil and commercial aviation, the regulation of air navigation, etc. Introduced by Mr. Curry, Calif., R., and referred to the House Committee on Military Affairs. Identical with the bill (H. R. 9804) introduced in the Sixty-sixth Congress by Mr. Curry.

Sixty-eighth Congress. Second Session

December 3, 1924. H. R. 10147—A bill to create a department of aeronautics, defining the powers and duties of the Secretary thereof, etc. Introduced by Mr. Curry, Calif., R., and referred to the House Committee on Military Affairs.

January 27, 1925. Hearings were held by the House Committee on Military Affairs on the Curry bill (H. R. 10147), and were continued on January 27, 29, 30, February 3, February 5, 1925. No report was made by the Committee.

February 13, 1925. Mr. Curry reintroduced his bill (H. R. 12285) to create a department of aeronautics, etc. with an amendment in order to take care of the general accounting office. The bill was referred to the House Committee on Military Affairs.

The Curry bill was also discussed at hearings held by the Select Committee of Inquiry into Operations of the U. S. Air Services, appointed under H. Res. 192. This Committee closed its investigations on March 2, 1925, and is expected to make its report to the Sixty-ninth Congress on or before the second Monday in December, 1925.

February 24, 1925. Representative Wainwright, N. Y., R., member of the House Committee on Military Affairs, announced that subcommittees of the military and naval affairs committees expected to meet in joint session early in the next Congress to discuss the nation's air defense.

Mr. Wainwright, former Assistant Secretary of War, as chairman of a special aeronautics subcommittee of the House Committee on Military Affairs, and Representative Swing, Calif., R., of a similar naval subcommittee, decided at a recent conference to postpone any action until after members had been given an opportunity to study the report of the Select Committee of Inquiry into Operations of U. S. Air Services.

Mr. Wainwright said that if a thorough survey of the problems of the air defense was found advisable, the matter might be taken up jointly by the respective subcommittees of the Senate and House military and naval committees.

Select House Committee of Inquiry Into Operations of U. S. Air Services

February 25, 1924. H. Res. 192—A resolution for the appointment of a Special Committee composed of seven members of the House, to be appointed by the Speaker of the House, to inquire into the operations of the U. S. Air Service, U. S. Naval Bureau of Aeronautics, and the U. S. Mail Service, and for other purposes. Introduced by Mr. Snell, N. Y., R., Chairman of the Committee on Rules. On March 24, 1924, the resolution was amended and agreed to. The amendment provided for nine members. The following members were appointed by the Speaker, as follows: Mr. Lampert, Wis., R.,

Chairman; Mr. Vestal, Ind., R.; Mr. Reid, Ill., R.; Mr. Lea, Calif., D.; Mr. Prall, N. Y., D.; Mr. O'Sullivan, Conn., D.; and Mr. Rogers, N. H., D. Hearings began Oct. 9, 1924, and were closed Feb. 28, 1925. On March 2, the Committee voted to close the investigation. February 18, 1925. Mr. Vestal, Ind., R., introduced a resolution (H. J. Res. 360) providing that the House Select Committee appointed under H. Res. 192 to investigate the Air Service be authorized to make their final report not later than December 15, 1925, to the Sixty-ninth Congress. The resolution was agreed to March 3, 1925.

A Digest of the Provisions of the Curry Bill (H. R. 12285)

To create a Department of Air, defining the powers and duties of the Secretary thereof, providing for the organization, disposition, and administration of a United States Air Force, and providing for the Development of civil and commercial aviation, the regulation of air navigation, and for other purposes.

Sec. 1. Creates an executive department, reporting direct to the President, to be known as the Department of Air, and a Secretary of Air, appointed by the President by and with the advice and consent of the Senate. Salary, \$12,000 per annum.

Sec. 2. Creates a position of Assistant Secretary of Air, an assistant and chief clerk, and other clerks, etc. Assistant Secretary of Air to be appointed by the President, by and with the advice and consent of the Senate. Salary, \$10,000 per annum. In addition to other duties, the Assistant Secretary of Air, under the direction of the Secretary of Air, shall be charged with the supervision of the procurement of all supplies used by the Department of Air, and other business of the Department of Air pertaining thereto and the assurance of adequate provision for the mobilization of matériel and industrial organizations essential to wartime needs.

Sec. 3. The provinces and duties of the Department of Air shall be to foster, develop, and promote all matters pertaining to aeronautics, including the collection and dissemination of information relating thereto, and shall be charged with the procurement and maintenance of all necessary aircraft, and shall perform all duties heretofore assigned to the War, Post Office, Navy and Treasury Departments, or any other department or agency of the Government, except as may be hereinafter provided, in times of peace and war, in so far as they relate to aeronautics, which shall include the supply of personnel and equipment for aerial routes, the responsibility for aerial defense, the preparation of aerial photographs, and the granting of licenses to operators of aircraft, and the promulgation of rules and regulations to govern such operators of aircraft; the issuance of licenses for all aircraft, the promulgation of rules and regulations governing the operation of aircraft; the supervision and establishment of governmental airdromes and landing fields, and the supervision of those used for commercial purposes; the preparation and distribution of pertinent meteorological data; the furnishing of personnel and equipment for the aerial activities of all governmental departments or agencies; the supply of personnel, the instruction, training, and equipping of air forces for the national defense, the development of aeronautical material, the fostering and development of commercial aeronautics; the establishment and maintenance of an air academy or academies, and the establishment and maintenance of aircraft factories as may hereafter be authorized by law.

Sec. 4. Assignment of Air Units.—That, at the direction of the President, units or detachments of the Air Force may be detached for service with the War and Navy Departments, and, in a similar manner, units or detachments of the Army and Navy may be detached for service with the Department of Air, and while so detached such units shall be subject to the laws and regulations governing the department with which they are serving.

Sec. 5. Provides for transfer of balances of appropriations, equipment, functions, etc., to the Department of Air.

Sec. 6. Charge of buildings or premises, expenditures for promoting, developing and regulating navigation of the air.

Sec. 7. Provides for transfer of civilian employees to the Department of Air.

Sec. 8. Provides for transfer of specified offices, bureaus, etc., under the jurisdiction of the War, Navy, Treasury, and Post Office Departments or any other governmental agency, charged with matters pertaining to aeronautics, to the Department of Air, etc.

Sec. 9. National Advisory Committee of Aeronautics is abolished as such, and its organization, property, and all funds and obligations are transferred to the Department of Air, and the Secretary of Air is authorized to hereafter control and direct the activities previously carried on by this body.

Sec. 10. Provides that the organization of the Department of Air shall, in addition to the Secretary of Air and the Assistant Secretary of Air, consist of four divisions to be known as:

The Air Force, the head of which shall be appointed by the President, by and with the advice and consent of the Senate, from the commissioned flying personnel of the line of the Air Force, for four years, and who shall be the military head of the Air Force, and be known as the Commander of the Air Force, and be the military adviser of the Secretary of Air, and who shall have the rank of division marshal during his tenure of office.

Division of civil aeronautics, the head of which shall be appointed by the President, by and with the advice and consent of the Senate, with salary equivalent to base pay and allowances of a brigade marshal.

Division of supplies, the head of which shall be appointed by the President upon recommendation of the Secretary of Air, and with the advice and consent of the Senate, from among the commissioned flying personnel of the Regular Air Force, for four years, with salary equivalent to base pay and allowances of a brigade marshal.

Division of research, the head of which shall be appointed by the President upon recommendation of the Secretary of Air, by and with the advice and consent of the Senate, from among the commissioned flying personnel of the Regular Air Force, to serve four years, with salary equivalent to the base pay and allowances of a brigade marshal.

Sec. 11. Naming the air force and the Constitution of same.

Sec. 12. Provides for the line and staff of the Air Force.

Sec. 13. Provides for constitution of the personnel of the Department of Air. For the purpose of training, education, technical development, and coordination of the departmental functions officers, enlisted men, and civilian personnel and necessary matériel of the Departments of War and Navy and other departments or agencies of the Government may be temporarily detailed or loaned from time to time to the Department of Air, under such regulations as may be agreed upon by the Secretary of Air and the heads of other Governmental departments or agencies concerned. Reciprocal arrangements are hereby authorized to be made for temporary detail of officers, airmen, and civilian personnel and loan of matériel for purposes similar to the above mentioned from the Department of Air to the other departments or agencies of the Government.

Sec. 14. The training of the Air Force and cooperation with other departments and designations of command.—

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Should the United States Create a Federal Department of Aeronautics?

Pro

Hon. Charles F. Curry

U. S. Representative, California, Republican

THE time has now come when the United States must take its place beside other civilized nations of the World in the development of its Air Power.

All other first-class nations have created departments of the air coequal with their armies and navies and are making aviation a primary consideration instead of regarding it as an appendage of other services. The United States can create the best aeronautical service in the World because we have the best men to man the planes, the best factories and all the raw material that go into their construction.

My bill (H. R. 12285) to create a Department of Aeronautics will prevent duplication in expenditure, and result in the highest efficiency at the least possible cost.

The War and Navy Departments have completely failed to recognize aviation as an independent instrument of war, a developer of commerce, and the greatest agency in the furtherance of our civilization. Instead of trying to simplify our aeronautical organization, these departments attempt to complicate the problem. Their recommendation to form yet another aviation agency in the Department of Commerce is a case in point.

All aeronautical effort should be centralized under a cabinet officer co-equal with the Secretary of War and of the Navy. Either this must be done or we must have a Department of National Defense, with one cabinet officer, and assistant secretaries for the Army, Navy and Air Force. Not only is this necessary to avoid the expense and useless duplication that now exists, but, at present, no one department in the government can be held responsible for the complete development of aviation.

United command over military aviation while it is separated between the Army and Navy, will always be impossible and our air forces will be dissipated. The Army and Navy have not yet come to a realization that the air is a medium entirely separate from either the land or the water.

An air force is designed to combat a hostile air force and to attack and destroy an enemy's land and sea establishments. It bears no proportion, no relation, and no similarity of organization to either armies or navies. It is indissolubly connected and joined with civil and commercial aviation, while its personnel are airmen instead of landmen or seamen. All other great nations have recognized this.

Aviation is an arm of the National Defense in itself; it is not merely a service, a part of an arm. It has numerous branches, such as pursuit aviation, which is the fast single-seater machines used to clear the air of the enemy; bombardment aviation, which carries the great bombs, the torpedoes, and the poison gas; and attack aviation, which has armored airplanes equipped with cannon, machine guns, and small missiles, and acts close to the ground or water. They are operated in great numbers and are directed by wireless telegraphy. They have their own system of maneuvers, their tactics, and

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Con

Archibald Douglas Turnbull

Commander, U. S. N., Retired

TO make an accurate comparison of the position of the United States with that of other powers is not easy. The figures obtainable are complicated by international differences in defining planes "in commission" and planes "in reserve," as well as by opinions upon the relative present values of particular types. Using the best figures available at this writing, and distinguishing between planes used for land and for sea work, we have, approximately:

	Army or General Air.	Fleet Arm.
Great Britain.....	516	120
France.....	1,188	54
Italy.....	700	456
Japan.....	410	170
United States.....	510	228

The table furnishes striking evidence of differences in national policies as based upon geographical position and upon location of probable enemies; it also emphasizes the inferiority of the United States in aircraft, when measured by balanced national defense built around a 5-5-3—1.75-1.75 treaty.

The special board appointed by the President to consider aircraft in relation to national defense reached its finding after listening to the testimony of the best-informed military men and civilians. The board, which made its report last February, recommended that aircraft carriers be built up to full strength and maintained there; that aircraft, in numbers, in performance and in personnel, be kept in proper proportion to a 5-5-3 naval strength; that airplane building provide the fleet with up-to-date machines, plus 50 per cent replacements, at a cost, for the first year, of \$20,000,000, and that the partially completed carriers be finished as quickly as possible.

With regard to the question of a separate air force, the board's finding supported the great majority of the witnesses examined. The consensus of opinion opposed this step upon the following grounds:

- (a) Its inadequacy for national defense.
- (b) The helplessness of aircraft operating over water, except very close to shore or supported by ships.
- (c) The inability of aircraft alone to deny command of the sea to an enemy.
- (d) The inability of aircraft to capture any enemy position or to occupy it after they had bombed the enemy out.
- (e) The inaccuracy of bombing, as shown by all tests, except at heights which make the bomber an easy target.
- (f) The unsuccessful result of a similar experiment in Great Britain.
- (g) The impossibility of creating a force of proper tradition and training from the nucleus of the present flying personnel of army, navy and Marine Corps because the missions and the objectives of land and sea forces differ too widely to permit any one flier to cope with both kinds of problem.

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Will An Independent Air Force Strengthen Our National Defense

Pro

Lester D. Gardner
Editor of "Aviation"

THE similarity of the terms united air services, a separate air force and independent air force is partly responsible probably for the confusion in the mind of the public as to just what the proponents of aviation wish.

At present, as is generally known, the Army has its air service. The extent of the Army's interest lies entirely in the sphere of reconnaissance, artillery fire control and bombing as it may be used on land and for the coastal defense of land establishments. To enable these to function, fast pursuit airplanes have to be available for clearing the skies of enemy aircraft. Added to this the Army employs captive balloons for artillery fire observation and small airships for reconnaissance.

Beyond serving the troops on the ground, the Army has no interest in aviation. Every dollar spent in extending the aerial branch of the Military Establishment is taken from the general army appropriation. As air service officers on flying duty receive 50 and 75 per cent extra pay, the aviators in the Army have always been considered as unduly favored by the rest of the Army. Maj. Gen. Mason M. Patrick is the highest paid officer in the Army, while Brig. Gen. Mitchell receives more than a major general. It is obvious that positions carrying such increases in pay, together with increase in rank, are targets for critical comment.

In the Navy the conditions, while similar, are not so acute. The plan of rotation of duty makes any officer's stay with the Bureau of Aeronautics comparatively short. From two to four years is about the average length of service of a naval flying officer, after which he returns to the fleet. The Navy uses aircraft of all kinds for service with the fleet and for patrolling the lanes of ship commerce. Here, too, the Navy regards aircraft as an adjunct to its main combatant unit—the fleet. Airplanes and airships are used for scouting, patrol, torpedo carrying, bombing, fighting and gun spotting. All it will be seen are to aid the fleet in carrying out its mission of destroying the enemy fleet or commerce.

The Post Office Department operates the airmail, the success of which is well known.

The National Advisory Committee for Aeronautics, the Bureau of Standards, the Department of Agriculture and about a dozen other bureaus are all interested in aviation at some point.

In various parts of the country there is a duplication of flying fields, repair shops, governmental aircraft factories, laboratories, training schools and aviation personnel. The total cost of these scattered aviation activities of the government in the last five years has been over \$433,000,000.

Now what do the aviation people want? To put it succinctly, they desire that the government give aircraft an opportunity to prove its wider utility without the limitations that a "Service" implies. To obtain this enlarged scope, a change in the present system is desired. The three plans mentioned in the first paragraph have

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Con

Kenneth Whiting
Commander, U. S. N., Bureau of Naval Aeronautics

WE believe that a united air service in this country would be detrimental to the interests of the country as a whole in that the Navy would not have its own aviation. It would receive its aviation from another department; it would not have control of the types of planes it was to use; the personnel would be trained under some separate department, and we could not feel assured that we would have sufficient aircraft to take care of us in time of war.

The difference between the Army and the Navy in aviation is this. When war is declared the Navy has got to be ready to go immediately. Under the form of organization of Government in this country the Army can never be ready to go immediately war is declared—unless our policies are entirely changed and we maintain a large standing army.

The training of naval aviators, or aviators who are going to work with the Navy, is intimately bound up with life aboard ship, with naval tactics, with naval doctrines, and naval ideas. It would, we think, be very difficult to train aviators who come from another department, who were trained first to fly under another department, and it would put the Navy in the position of being responsible, you might say, to two bosses—the Secretary of the Navy and a secretary of air.

A naval officer might desire to operate aircraft under certain ways that would not be satisfactory to the secretary of air. To whom would the naval officer then be responsible? Would he have to be court-martialed by

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Walter Atlee Edwards

Lieutenant Commander, U. S. N., Bureau of Navigation

THE following are arguments which may be advanced against a unified air service:

1. Unity of command in war is an essential. In military preparations for war those charged with responsibilities for efficiency in the Army and the Navy must have full cognizance of training. The air is not a separate war area, but one common to both the Army and the Navy. The types of machines and numbers in the aviation services, which are adjuncts to the Army and the Navy, as well as the tactics of the air force, must accord with the general military and naval policies. The above are impossible in a united air service.

2. Naval aviation is a part of the fleet, and must exist as an integral part of the fleet. Naval aviators must be of the Navy, have naval training, and be vitally interested in the work of the Navy; otherwise there must be loss of efficiency. It is difficult to see how air stations like those at Hampton Roads and Pensacola—where these form a part of naval stations—can be separate from the Navy.

3. The types of flying machines well adapted for naval purposes have not yet been produced. A tremendous

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Chief of the Army Air Service Makes Recommendations for Reorganization of Air Service

Statement by Mason M. Patrick, Major General, U. S. A., Chief of the Army Air Service, before U. S. House Select Committee on Aircraft Investigation, January 5, 1925.

BEFORE any statement can be made concerning the organization or the operation of an air force there must be a fairly clear understanding of what part aircraft will play in the next war; nor can the answer to the question be really understood without such knowledge.

There are, on the one hand, enthusiasts who believe that the coming into being of aircraft has practically scrapped all other combat agencies; and, on the other hand, conservatives who consider aircraft as merely auxiliaries to previously existing combat branches. The truth, of course, lies somewhere between those two views.

I recently recommended that the War Department prepare legislation for the reorganization of the Air Service as an air corps apart from the War Department, but under the Secretary of War.

I have become convinced, after several years study of the subject, that the ultimate solution of what I call the air defense problem is the concentration of responsibility therefor on one head. But I do not believe that the time for that is quite ripe yet. In the meantime, I think that it is well to utilize existing agencies if it is possible to do so, instead of creating new ones.

The reorganization that I have recently recommended to the War Department will provide:

(a) An agency, the air corps, having as its primary and exclusive function, the development and utilization of air power as an arm for national defense, air power being defined as the ability of a nation to wage war through the action of aerial forces, either alone or supported by land and sea power.

(b) A semi-independent status for the air corps which will facilitate the solution of the personnel, supply, and morale problems which are peculiar to it.

(c) A separate and all-inclusive budget for the air corps, utilizing, however, all suitable existing War Department agencies without duplication, through suballotment of funds for expenditure in procurement and development.

It is believed imperative that more specific and adequate provision be made for the development and utilization of air power as an arm for national defense. The present national defense organization is inefficient in that no single agency has this responsibility as a primary and exclusive function, but all air agencies have it to a certain implied degree.

This uncertainty must result in either a neglect of proper development or of duplication of effort, with the inevitable consequence of uneconomical expenditure of funds. Either a new agency of the Government must be provided and charged with this development as its primary function or some existing agency must be specifically charged with this responsibility in addition to its present functions.

While the unification of all air elements for air defense under one responsible head may be the ultimate solution of this problem, it is evident that this important step should be taken only after careful and extensive study has been made of all of its phases. As a remedial measure, which could and should be put into effect immediately, an air corps under the Secretary of War with an organizational status somewhat similar to the status of the Marine Corps

under the Secretary of the Navy, is suggested. The Marine Corps is joined to, but not merged in, the Navy. They have their separate organization. They have their commandant. The Marine Corps submits its own estimates to Congress. The commandant of the Marine Corps reports directly to the Secretary of the Navy, and obeys his orders. The commandant of the Marine Corps is solely responsible for discipline, and for supply and all other matters connected with the use of his armed force. It is a similar organization that I have recommended to the War Department for the air force.

It is believed that the placing of this responsibility on the Army Air Service is entirely logical. The Army Air Service has been the chief proponent of the development of air power and can give to this important task the full and complete devotion and enthusiasm that is essential if this development is to be vigorously and efficiently pursued.

The present Air Service problems in connection with the procurement, training, assignment, promotion, elimination, and retirement of its personnel are separate and distinct from those which confront the Army as a whole. The injustice of the single list for promotion in its application to the peculiar conditions of the Air Service has been recognized by a War Department board as early as 1922, when the so-called Shanks Board reported in part—

The Board is of the opinion that this situation will affect adversely the efficiency of the Air Service * * *. The Air Service is the only branch of the service which is adversely affected as a corps by the promotion situation.

The bulk of the enlisted personnel of the Air Service are required as mechanics and technicians; the procurement and training of this personnel is a problem very different from the general problem of the Army in this connection.

The mere fact that the Air Service is a supply branch as well as a combat branch, and yet its work as such is almost entirely for its own service, indicates at once its peculiar supply status. Air Service procurement, storage, issue, property accounting, maintenance and repair policies should be formulated with specific and almost exclusive reference to Air Service needs.

Once the decision is made to place upon the air corps the development and utilization of air power as a primary function, there should follow immediately a solution of the vexing problem of air coast defense. There is an undeniable duplication of coastal air facilities in the United States and in its possessions. The creation of an air corps primarily as an air-going combat unit should remove this question from a consideration of whether the Air Service of the Army or the Air Service of the Navy should be charged with operations in this "twilight zone" which includes the water area within the reach of air operations conducted from land bases. I have no hesitation in saying that the assignment to the air corps of all air coast defense functions which can be performed from land bases (the limit to be taken at about 200 miles under the present state of aircraft development) will be one of the greatest gains to efficient national defense which will result from the formation of the air corps.—*Extracts, see 1, p. 251.*

Secretary of War States Position on Reorganization of Air Services

Statement by the Hon. John W. Weeks, U. S. Secretary of War, before U. S. House Select Committee on Aircraft Investigation, January 5, 1925.

IT has been suggested that the Air Service might be put on something like the same status as the Marine Corps of the Navy. I am not in favor of making the Air Service, in its relation to the War Department, have a relationship similar to that the marines have in the Navy Department.

That is one of the weaknesses in the recent development of this Government, in my opinion. We have several very important organisms which are not connected with any department. They report directly to the President, so that the President, in addition to his multitude of other duties, is running practically a department. I might mention the Interstate Commerce Commission, United States Tariff Board, the Federal Trade Commission, the Shipping Board, all reporting directly to the President.

I do not want these branches of the War Department's activities reporting directly to me. I want their requirements and necessities to go through the organizations provided for that purpose, and then I will do with each what I think best when it gets to me, if it is a matter of sufficient importance for me to consider.

I would object to that course when we come to a conjunction of the two Air Services, which has been advocated by some I think before this committee, and disapproved by others. There are about as many minds as you can find men expressing an opinion on that subject; that is, among those who know anything about it.

I think, speaking generally, it might have some advantages in time of peace. But we are trying to cooperate in purchases and in every other way as far as possible. I have not recently heard any particular complaint that cooperation was not going on satisfactorily.

The flying force would probably like to be a distinct force. They are irritated with being in line of promotion with other branches of the service. They would like to have a separate promotion list. But you can not change any list, or any pay scale in the great military establishment without initiating new matters that may perhaps do more

harm than good. I do not like to make these changes.

I do not believe in a single air force. I certainly would not believe in a cabinet officer at the head of an air force.

When you come to the question of war, which is the ultimate goal which we must look to, the commanding general of the Army must have under his immediate and direct control every part of the military establishment. It would be idle to think of a Chief of Cavalry who had something to do with the disposition of cavalry forces. And I think it would be quite as idle to have a separate chief of the airplane service who would have anything to do in the final disposition of the airplane forces in time of war.

It may be said that if there were a separate air establishment the commanding officer of the Army could make requisition for what he needed and under the direction of the President it would be assigned to him. But he has nothing to do with the training of that force during the short period the war may have been going on. There has been no liaison between the different branches of the service. From the very beginning of hostilities an air force ought to be liaisoned with other parts of the establishment and be under a single command.

I would like to have the field of operation of the Army and Navy determined by law; because I do not think the War Department and Navy Department are going to fully agree on that. My own conception is that the Navy Air Service should relate to the fleet, and the operations of the fleet wherever it may be; and that the Army Air Service should cover all other operations. And yet, as appropriations are now made the Navy has had, for the last four years, anyway, larger appropriations than the Army. My own conception of the two services, which possibly would be considered by some as prejudiced because of the position I hold, is that the Army requires about twice as much air service to carry out the proper functions of its different services, as the Navy does. In other words, about two-thirds and one-third.—*Extracts, see 1, p. 251.*

Secretary of the Navy States Position on Reorganization of Air Services

Statement by the Hon. Curtis D. Wilbur, U. S. Secretary of the Navy, before U. S. House Select Committee on Aircraft Investigation, December 17, 1924.

THE officers in the department are almost unanimous in their opposition to a united Air Service, and that has been my own view and is now. There are two or three fundamental difficulties. One is the question of retirement. Speaking broadly, the usefulness of an officer in the Air Service—certainly a flier—would terminate around 40 years, whereas we retire our captains at 56 and our admirals at 64. If it were found necessary to retire men at 40 years of age, of course there would be a tremendous expense, as well as a waste of very good material. That, perhaps, is one of the smallest and least important reasons, although it is a practical one.

There is the question of discipline. The introduction into the Army or the Navy of a separate service in contact with the service but not amenable to the discipline of the service, I think, would be very bad.

I should regard it as a very disastrous thing to have a separate Air Service. Of course, it would result immediately in the promotion of younger officers to higher positions. I do not want to cast any aspersions on the motives of these gentlemen, but it is perfectly manifest that is what would result in a reorganization of the Air Service.

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Would a United Air Service Prove Advantageous to the Country?

Pro

Howard E. Coffin

Vice President, The Hudson Motor Car Company

I BELIEVE that our governmental organization has not to date been adequate for the handling of the general aeronautical development which we may designate as American air power. I would like to point out that this expression, "American air power," comprises many things not directly related to military or naval aviation.

There have been various attempts to coordinate our governmental air activities. The creation of the National Advisory Committee for Aeronautics marks perhaps the first effort at coordination, but the work of this body has been restricted to the fields of science and research. Various joint Army and Navy boards have been formed dealing with technical aspects of the art. Early in the war, on May 18, 1917, an Aircraft Production Board was organized under the advisory commission of the Council for National Defense. Later on, in October, 1917, the Aircraft Board was created by act of Congress for the continuation of the coordinating industrial and advisory activities initiated under the advisory commission of the council. Later on, in April or May, 1918, military aviation was shifted from the Signal Corps to the Bureau of Aircraft Production created by Executive order under an Assistant Secretary of War, but the Aircraft Board and the Joint Army and Navy Technical Board continued as the only coordinating influence between the military and naval programs.

But neither prior to the war, during the war, nor since, has any governmental agency, either executive or advisory, been charged with responsibility for the furtherance of the commercial aspects of the aeronautical art and with the coordination or direction of the general policies of the various governmental departments.

There has been no single agency directly charged with the promotion of American air power.

It is obvious, I believe, to all of us, that commercial aeronautics must be made the backbone of development of American air power. It should be obvious also that excepting only those auxiliary services actually necessary in connection with the field operations of other departments of the Government, particularly of the War and Navy Departments, all air activities should be grouped under a single authoritative head and the responsibilities for achievement definitely fixed.

I desire to call particular attention to the need that in any plan of organization adopted in time of peace provision must be made for the rapid induction into the combat air services of great numbers of personnel of little or no previous experience or training perhaps in either military, naval, or aeronautical affairs. Also, if much of the best thought of the world on aeronautics is to be given consideration we must provide in our organization for a peacetime nucleus of what may well eventuate into a powerful independent air force in any war emergency. There seems ample reason for conclusion that in any future armed conflict there is a likelihood of battles of the air being fought

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Con

William A. Moffett

Rear Admiral, U. S. N., Chief of Bureau of Aeronautics, Navy Department

THE subject of a united air service or of a department of the air has been discussed at length at congressional hearings, and has been given careful consideration by the War and Navy Departments, as well as by the President of the United States two years ago. The result of these hearings and studies has been that no official sanction has ever been given by either the War or the Navy Department or by the President to the proposal, but that, on the contrary, the proposal has been deemed an unwise one.

At first glance the proposal may give the impression of being efficient and economical, especially to one having no intimate knowledge of the activities of the Army Air Service and of the naval aeronautic organization. Opposition to the proposal on the part of naval aviators and naval officers in general is based on their knowledge of the needs of the Navy in aviation and on their knowledge of the impossibility of meeting those needs fully and efficiently except by the Navy itself.

I do not think we can come to any correct decision regarding the organization of our aviation forces without a thorough understanding of what those forces would be required to do in the case of war, and such understanding must be derived from a study not only of the possibilities of aviation itself but also of our national situation, our geographic position in the world. Our Government, like every other government, must prepare to defend itself in two general localities—at sea and on land.

It so happens that our geographic position in the world, 3,000 miles of water separating us from the nearest great power, throws the burden of the first defense, and we hope the final defense, against aggression, on the Navy of the United States. The Army can never act against such aggression unless the foe breaks through the defense of the Navy first, or, in case of aggression on our part, unless the Navy carries the Army overseas.

The present state of development of aircraft is such that a shore-based air service can not act offensively against a nation overseas unless it is first carried across the sea in ships. A shore-based air force will not be called upon to act defensively against the enemy's ships until the Navy has failed in its mission of keeping them at a distance.

What the future developments of aircraft may be no one can foresee, but from present indications it is unlikely that aircraft will ever be able to operate overseas without the use of ships. From the standpoint of national defense or of national offense these facts point out the supreme importance of naval efficiency in all its branches.

I think the industry is in a very unsatisfactory condition from the viewpoint of the industry as well as from the viewpoint of national defense. I think it is due to several reasons. One is that it is dependent on the Government for work; that is, the Army, Navy, and the Post Office Department. The orders coming from civil life are practically negligible—I would say almost nothing.

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Is Consolidation of the Air Services a Necessary Step?

Pro

William Mitchell

Brigadier General, U. S. A., Assistant Chief, U. S. Army Air Service

TODAY air power absolutely determines the defensibility of the country. If control of the air can be obtained and maintained by the country, it can prevent invasion of the country by either hostile land, sea or air forces. It is the only element in national defense that can do this alone and unassisted. The degree to which that can be performed by air power is a question of its organization, training and use.

So far as expenditures for national defense are concerned, it promises to cut them down in a tremendous proportion, particularly for defense over the sea.

Now, in order to develop air power it must be made a main proposition. As long as it is held as auxiliary or secondary to other existing agencies it will not come to its full development. The organization that we have in this country now ties aviation to older existing agencies, which it promises either to completely supplant or put entirely out of business.

The air business now is a part of the Army; it is a part of the Navy; it is a part of the Post Office Department; and the other big organization that is handling it is the National Advisory Committee. Each one of these is an organization that has some other vocation or avocation than the development of air power. The personnel for the Air Service is selected from people who have been trained for other objects first and then for the air second. It is a waste of time to train a man to dig a hole in the ground to get away from hostile shell fire when he is in the air force and must fight 20,000 feet up in the air.

My first suggestion is that you create a department of aeronautics co-equal with the Army and Navy, which will have under it three principal divisions: One, a department of fabrications for the building of aircraft, experimentation, etc. Another department of civil aviation, which would have to do with the development of civil and commercial aviation. The third big division would be the military aviation. First providing for the defense of the country in the air and then allotting such auxiliaries to the Army and Navy as were necessary for their proper use. We would cut down on the auxiliaries as much as we could and concentrate on the elements that give the punch, whether it is aeronautical, military or naval. A Navy should not have a single plane which can not be taken out and used on the high seas. That is what we have a Navy for. They should go out on the water and not stick around the shores. As a defensive agent on the surface of the water along our coasts, a Navy's usefulness has gone. Air power is dominant now. If we had no fleet at all, and had sufficient air power with its auxiliaries, the country could not be invaded. A fleet, therefore, is an offensive instrument, and as long as what we call naval power exists, it

On March 30, 1925, Brig. Gen. Mitchell was designated to be air officer of the Eighth Corps area with headquarters at Fort Sam Houston, Texas, effective upon the expiration of his term as deputy chief of the Army Air Service on April 26, 1925. Lieut. Col. James E. Fechet, commanding officer of Kelly Field, Texas, has been named to succeed Gen. Mitchell as deputy chief of the Army Air Service.

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Con

A. W. Johnson

Captain, U. S. Navy

AMONG the arguments advanced by proponents of a single air service are that consolidation of army and naval aviation will promote the development of aviation in the United States, reduce the cost of production of aircraft, and insure greater economy in the administration and operation of our national aviation activities. They point out that for these reasons Great Britain consolidated the Royal Naval Air Service and the Royal Flying Corps into the Royal Air Force under a separate department with its own cabinet officer. As a result of this they claim that aviation has gone ahead in England whereas in America it has fallen behind.

The amalgamation of the Royal Naval Air Service and the Royal Flying Corps took place on April 1, 1918. The critical conditions in England at that time are still fresh in our minds. They were a deciding influence upon those responsible for the creation of the Royal Air Force. The naval war was practically over, the submarine campaign was already doomed to collapse, and the German High Seas Fleet was powerless. On land the situation was very different. The allied armies were in a desperate situation, England was within bombing distance of the German aviators, and victory was by no means assured to the allied cause. It was, therefore, perfectly logical that the British Army should call upon the Navy for such reinforcements as were not absolutely necessary at sea. In view of the fact that the naval war was practically over, urgent consideration was given to the best method of procedure to reinforce the hard pressed armies with naval aircraft. The result was the amalgamation of the two services into the Royal Air Force. The two forces were amalgamated because it was not considered practicable to loan the naval air service to the Army and have the navy personnel work under the direction of army personnel. It was a military necessity of the time.

But, the emergency created by the war having passed, the First Lord of the British Admiralty in the naval estimates for 1920 and 1921 reported as follows:

So far as can be foreseen naval requirements will be met by the proposal ultimately to form a naval wing under the Air Ministry, with a personnel especially trained in naval work.

The foregoing indicates that all was not well, and that aviation was not fulfilling the requirements of the navy. Subsequent representations by the Royal Navy and by the British Army disclose the fact that the opposition to the existence of a royal air force by the Army and Navy was steadily growing with the realization that the respective services should control such air units as were allocated to them. The Navy, particularly, was dissatisfied with the progress made in naval aviation, and it was felt that the fleet was being deprived of one of its most useful weapons.

The Admiralty has since been given partial control of the flying army afloat and some supervision of training for sea reconnaissance. Undoubtedly this has improved the naval situation in England, but it is only a temporary expedient and the problem there is still far from a satisfactory solution.

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Will Sea Power Be Displaced By Air Power?

Pro

William Mitchell

Brigadier General, U. S. A., Assistant Chief, U. S. Army Air Service

THE United States is faced with the alternative of progressing in its aeronautical organization and consolidating its air activities under one responsible head, or going on with its effort split up between other services that have a major function apart from aeronautics.

Aviation is very different from either armies or navies in its economic aspect. Every military airplane can be used in time of peace for some useful undertaking not necessarily connected with war. Every pilot employed in civil aviation can be used in case of war. Every mechanic used in civil aviation is 100 per cent efficient in time of war.

A modern battleship may cost somewhere between \$50,000,000 and \$70,000,000; it may require, on an average, one cruiser costing between \$20,000,000 and \$30,000,000, four destroyers costing \$3,000,000 to \$4,000,000 each, four submarines, a certain amount of air power, to protect it, and, in addition to this, great stores for maintaining the personnel of more than 1,000 men, and dock yards and supply facilities to keep them up. So that every time a battleship is built, the nation constructing it is binding itself to about \$100,000,000 or more of expenditure and a certain amount a year to keep it up. Battleships have required heretofore complete replacement every four years to prevent their becoming obsolete.

As battleships and surface craft are helpless against aircraft unless they themselves are protected by air power, and as their influence on the destruction of seagoing trade is secondary to that of the submarines, nations are gradually abandoning battleship construction. Three are keeping it up—England, Japan and the United States.

England is entirely dependent for existence on her sea-borne trade; Japan, also, is dependent almost entirely on her sea-borne trade. Whereas England and Japan would have to protect their commerce in the Seven Seas or starve, America could entirely dispense with her seagoing trade if she had to, and continue to exist and defend herself.

Submarine officers think our next national emergency will find them fighting on our most advanced front from the day hostilities begin.

The superior fleet menaced by submarines and long-distance aircraft could not long exist on the high seas and would be of little service there under such conditions. A fleet action in the old sense may never occur again. Undoubtedly submarines will be developed into aircraft carriers in addition to their other uses. In the future, therefore, surface navies based on battleships cannot be the arbiters of the communications over the ocean.

The tremendous cost of these craft and their upkeep will be applied to more efficient and more modern methods of defense. Fighting airplanes can be built in production with their engines for \$15,000 to \$75,000; at an average of about \$25,000. Therefore, so far as construction is concerned, at the price of a battleship and its accessories—that is, \$100,000,000—an average of 4,000 airplanes can be built for the price of a battleship. The United States is now allowed a fleet of eighteen battleships. On this

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Con

Albert Gleaves

Rear Admiral, U. S. N., Retired

THE development of aviation is imperative for the national defense. We must have a preponderating force of airplanes and aviators in order that our fleet may be immune against aerial attack, and its efficiency increased by a superior ability to scout, and by airplane spotting, be enabled to attack the enemy fleet by gun-fire before it appears on the visible horizon. The indispensability of aircraft is universally recognized, and air power is as much a part of fleet equipment as steam power or gun power.

It is the policy of the Navy Department to maintain its air force independently of other air forces and to man it with Navy personnel. We of the Navy have peculiar problems. We believe it impossible to meet the needs of naval aviation efficiently if the naval air service were amalgamated with those of other departments of the Government. So long as I can distinguish between fact and imagination, and recognize the difference between sound conclusion and hysterical delusion, there can be no doubt in my mind that air power is a vital and essential arm of the fleet, but cannot dominate it.

The United States today has 1,638 merchant ships in operation on the high seas. They carry about thirty-five per cent of America's trade, the remainder being carried in foreign bottoms. Our total foreign trade for the past year amounted to eight billion dollars. Ships flying the American flag are scattered over 80,000 miles of our trade routes. A navy is the only guarantee of protection to these ships at sea, our Merchant Marine.

If air power alone is sufficient to carry out these functions then I am willing to reverse my position and agree that a navy is nothing more than a useless and expensive antique. Let us take for granted that ships may be sunk by aircraft. Let us presume that these ships are guarding our commercial sea lanes five hundred, one thousand, two thousand miles from our coast. Will the aircraft which are to sink them spring from the sea? Certainly they cannot strike from shore bases at this distance. The answer is obvious. These planes must attack from ships, and it would be more than absurd to presume that the ships which they attack would not be adequately equipped to repel them by aircraft. On this basis aviation is simply a new element in naval warfare. Like armor plate, the rifled gun, the submarine and the destroyer, it serves to further complicate the problems of naval strategy.

I deny that the battleship is obsolete; that surface ships are doomed; that troops cannot be transported overseas; and that fortifications are useless. Every assertion I have seen that sea power has passed away is based upon incorrect premises and inaccurate conclusions, and only tends to undermine the confidence of the country in the Navy. Although absurd *per se*, the claim that sea power has vanished or is vanishing is a menace to our national defense.

The air enthusiasts invariably ignore the severe limitations of war conditions. They tell us the Martin Bomber flies 1,500 miles without alighting, but refrain from adding that her war equipment of bombs will reduce this distance

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Battleship vs Airplane

Pro

Herbert S. Howard

Commander, Construction Corps, U. S. N.

IF the extreme view held on one side of the argument is to be believed, an air force, properly equipped with planes, lighter-than-air ships, bombs and gas, has rendered a navy unnecessary, or at least relegated it to a very secondary position.

To support this view the now almost classic example of the bombing of the battleship *Ostfriesland* is cited, with reference also to the bombing of the *Virginia* and *New Jersey* and to the sinking of the new battleship *Washington* last fall. The *Ostfriesland* was an ex-German battleship, designed in 1908 and completed in 1911, which makes her of about the same period as the *Florida* and *Utah*, the oldest ships of our Navy at the present time and quite out of date so far as protection is concerned. In 1921 it was decided to test out against her the results which could be attained by bombing from aircraft. After being made as water-tight as possible without too great expense at the New York Navy Yard, she was towed to what we know as the Southern drill grounds, about 50 miles off the Capes of the Chesapeake. On the way down she leaked so badly that on the first day of the test she already had several hundred tons of water aboard.

The first test called for was the dropping of deck-piercing bombs from an altitude of 4,000 feet on the deck of the *Ostfriesland*. Not only was the sea too rough for the necessary inspection trips of the board to the *Ostfriesland*, but the airplanes could not have seen the ship, as the clouds would have obscured her with the planes at 4,000 feet. By noon the sea had gone down, but the clouds persisted. The deck-piercing bomb attacks were, therefore, further postponed and high-explosive bomb attacks proceeded with, as in dropping these bombs the planes could fly at lower altitudes. The tests were made first with 230-pound bombs, then with 500 and 600 pound, next with 1,000-pound, and finally with 2,000-pound bombs. The airplanes were permitted to fly just high enough to keep clear of the effects of the explosions.

Inspections aboard showed the effect of the bombs in the holes torn in decks and bulkheads, but torn less than had the hits been with high-explosive, large caliber shells.

By the end of the first day of bombing 52 planes had attacked the ship with 69 bombs, ranging in weight from 230 to 2,000 pounds each. The only effect really noticeable was that due to the leakage caused, not from the hits, but from the bombs which missed the ship and exploded close alongside. Even this leakage could have been handled by the pumps had there been steam up and a crew aboard.

The next morning the attacks began again, starting with five 1,000-pound and ending with six 2,000-pound bombs. Due to the shaking up received from the misses alongside, the leakage increased, and finally, with a 2,000-pound bomb exploding close under the stern, the ship went down.

In 1923 the *New Jersey* and *Virginia*, completely out of date and stripped of watertight doors and fittings, were towed down the coast and anchored off Hatteras. There they were bombed and sunk quite as expected. Somewhat the same fate befell the *Alabama*, an even older ship,

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Con

William S. Sims

Rear Admiral, U. S. N., Retired

THE most important thing for the defense of America today is submarines and airplanes. But I would like to modify that statement by saying that if you had nothing but submarines and airplanes you would be confined absolutely to the defense of your home coast; that you could only operate to the extent of the radius of your airplanes, and that you could not go to any of your outlying possessions unless you had the surface navy to take you there.

I do not agree that the battleship is the most important element of strength in a modern fleet. Airplane carriers, I think, are more powerful as a capital ship than the battleship is, because the airplane carrier meeting the battleship out at sea would defeat it inevitably. A fleet of battleships cannot, in my opinion, control the sea today against a fleet that has command of the air. No fleet could cross the Atlantic or Pacific today without an air force greatly superior to that of an enemy on the other side. A fleet of battleships would not have much chance against an air attack, unless protected by a superior air force of its own. A fleet without such an air force would be bombed clean out of the water. At the tests off our coast, bombs of only 2,000 pounds were used in bombing the German dreadnaught *Ostfriesland*, but they could just as easily dropped 4,000 pound bombs. One of those striking a battleship would most certainly put her out of action, and if it struck in the water alongside it would blow an immense hole in the hull. The *Ostfriesland's* side was blown in by a 2,000 pound bomb that struck in the water close by her, and she sank in a few minutes. The battleship has certainly seen its best days.

If a 2,000 pound bomb were dropped close to the turret on the deck of a battleship, I do not see how it could avoid jamming it. If it struck near a smoke pipe it would, of course, blow it overboard the same as it would a paste-board box. It would also blow the mast out if it struck near it.

To my mind the concussion of 2,000 pounds of TNT, or 1,000 pounds of TNT in a 2,000 pound bomb, exploding on the deck, would be very disastrous. In the first place, there is a certain delayed action in all fuses; they are not absolutely instantaneous. It would strike the upper deck. There is no protection in that deck, and there is no protection in the next deck. It is only when you get farther down that you come to the protective deck that runs from the armor on one side to the armor on the other side, and those bombs would go straight through down to that point. A dummy bomb made out of concrete will go down there. A piercing bomb will go through there, and then it will explode in a confined position down there, and undoubtedly all of that superstructure on both sides would be blown overboard.

The effect of the 4,000 pound bomb would be about 50 per cent greater. The effect does not increase in proportion to the weight.

I think it possible and practicable for an airplane to carry a 2,000 pound bomb, or a 12,000 pound bomb, and drop it on a ship. They have carried the 2,000 pound bomb, and they can carry two or three of those. One of

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Naval Aircraft Carriers vs Airship Carriers

Pro

Hilary P. Jones

Rear Admiral, U. S. N., Chairman, Executive Committee
of the General Board

AN editorial recently appeared in one of our leading papers in which an attempt was made to show the advisability and practicability of building airships twice the size of the *Los Angeles* and using them as aircraft carriers. The editorial evidenced but little knowledge of the real facts.

The lifting power of an airship (lighter-than-air) follows from elementary laws of physics, and is the difference between weights of equal volumes of gas and air. For an airship of 5,000,000 cubic feet—which would be practically twice the size of the *Los Angeles*—filled with helium gas, the lifting power would approximate 145 tons or 310,000 pounds. The weight of the airship structure complete with engines but without fuel would be 40 to 50 per cent of this total lift, or say 65 tons, leaving 80 tons available lift for armament, fuel, ballast, crew and effects, provisions, spare parts, and cargo. About 70 knots would be the maximum speed of this airship, but to drive her at the more conservative and economical speed of 60 knots would require 2,000 horsepower. Airship engines require 0.55 pounds of fuel and oil a horsepower hour. This gives a round figure, approximately correct, of one ton of fuel and oil for each 100 nautical miles traveled by such an airship at 60 knots, which speed probably could not be maintained with airplanes attached.

The ship would require a crew of at least forty, weighing with their effects and provisions, five tons. To land successfully and be free to maneuver in a vertical plane, an airship must carry ballast. The higher the expected altitude the greater the quantity of ballast required. For an ordinary flight of such a ship, at low altitude, probably five tons of ballast should be carried.

These figures indicate that under the most favorable conditions, carrying only the crew and a minimum of ballast, we get a possible distance traveled at 60 knots of 7,000 miles. *But this is without airplanes or armament.*

Bombing airplanes fully loaded with a crew weigh three to five tons. Pursuit planes weigh 1.0 to 1.5 tons. Assuming the special construction of light-weight airplanes for these airship carriers, we may state the weight of a bombing plane as, roughly, three tons, and that of a pursuit airplane as one ton.

An editorial on this subject stated that such a ship could carry 30 bombing airplanes and 150 pursuit airplanes. Thirty bombing airplanes and 150 pursuit airplanes would weigh at least 240 tons—just three times the weight the airship can possibly lift from the ground. (This is omitting fuel, crew, or ballast.) The airship could not even rise from the ground with the load stated.

Suppose she could rise from the ground, and these airplanes should be released, the lightening of the load would cause the airship to shoot straight up until gas was let out sufficient to correspond with the load released, and then when the airplanes sought to return the airship would not contain sufficient gas to hold them in the air.

Our problem of national defense lies not simply in

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Editorial in "The Washington Post"

February 1, 1925

THE cost of the two airplane carriers now under construction for the United States Navy has been increased to a limit of \$34,000,000 each. Each will have a speed of 30 knots, a radius of action of 7,000 miles, a crew of 1,500, a defensive armament only, and a carrying capacity of 75 airplanes.

The same amount of money, \$68,000,000, would build 27 airship carriers of airplanes, at a cost of \$2,500,000 each. Each of these airship airplane carriers would have a speed of 60 miles an hour, a radius of action of 7,000 miles, a defensive armament, and a carrying capacity of 30 bombing and 150 pursuit airplanes. Each airship would be sustained by 5,000,000 cubic feet of helium gas, constituting a vessel twice the size of the *Los Angeles*.

The naval carriers of airplanes are limited in operations to navigable waters. The carrier airships would not be limited by sea or land. The naval carriers are subject to land, sea, or air attack. The airships would be subject only to air attack.

The total number of airplanes that will be carried by the two naval carriers is 150. The total number of airplanes that could be carried by 27 airships, costing no more than the two naval carriers, would be 4,930.

The naval carriers will accompany the fleet, and will be defended by the fleet. They are unable to escape from an air attack, and can be defended only by airplanes against such an attack. The carrier ships could accompany the fleet and then extend their operations over land. They would be better defended against air attack because they would carry more airplanes. Instead of being subject to bombardment from coast fortifications they could sail untouched above such fortifications.

The launching of an airplane from a naval vessel's deck and the receiving of a plane upon deck is attended with risk. So is the launching and receiving of an airplane by a mother airship. But both feats have been accomplished. The fact that an airplane's element is the air, while a naval carrier's element is the water, makes it improbable that launching and receiving will be as easy in a heavy sea as the launching and receiving of airplanes by airships, even in strong winds, where both vessels are in their element.

There is no need, of course, for 27 airships carrying 4,930 airplanes. But there is need of economy and efficiency in providing for the national defense. If airships are better than naval vessels for carrying airplanes, they should be used.

The superior speed of airships as compared with naval carriers would simplify problems of fuel replenishment. An airship can cross the ocean in one-half the time consumed by a naval carrier.

Foreign nations will soon have airship carriers for their airplanes, thus bringing any part of the United States within their radius of action. The United States must have means of meeting sudden attacks by airplanes brought by airships across oceans to a point within 200 miles of the point of attack in the interior of this country. No method of meeting such attacks is in sight except by the building of airships capable of carrying airplanes.—*Extracts.*

*Pro—continued*Hon. Charles F. Curry—*contd. from p. 234*

their strategy, entirely different from either army or navy maneuvers, tactics, and strategy. Gradually they are developing their own means of supply through the air—that is, large airplanes and airships, or dirigibles, can be utilized to distribute supplies and carry airplanes. Soon they will be practically independent of any means of communication on the ground. This military development has come so fast that not only the officers, and particularly the older officers, in the army and navy do not realize it, but few in civil life know anything about it.

Every advance in the art of war has been accepted reluctantly and only after its superiority over old and worn-out methods have been proven on the field of battle, frequently at the cost of empire, often to the retardment of civilization.

Today the fighting force of the air is handicapped by the usual opposition to new methods of warfare, and instead of being assigned its proper place as an equal and independent arm of the national defense it is being subordinated to the army and navy and its development hindered.—*Extracts, see 7, p. 251.*

Lester D. Gardner—*contd. from p. 235*

been proposed with this end in view.

The united air service plan provides for combining the present services of the Army, Navy and Post Office and placing the personnel under a single control. All procurement of aircraft, upkeep, training of aviators and the maintenance of a central reservoir of flying personnel would come under this bureau or whatever it would be called. It would, however, still be a service like the marine corps.

The separate air force would be a branch of a department of defense, co-equal with the Army and Navy, all three directed by a secretary of defense, the aviation branch being under an assistant secretary. This plan is the one proposed by the report made to President Harding for the reorganization of the Federal executive departments and is the ultimate aim of all aviation advocates.

An independent air force is the first step proposed by aviation advocates to be taken toward the previous plan. As outlined in the Curry bill, a secretary of aeronautics having a cabinet portfolio would head a department of aeronautics having three bureaus. A procurement bureau would provide aircraft for all government air work. All experimentation, repair and upkeep would be under the direction of the civilian head of the procurement bureau.

The supervision, control and regulation of commercial aeronautics would be placed under a second bureau. The functions of this bureau are practically identical with those that it is proposed to place in the Department of Commerce by the pending Winslow bill.

The third bureau under the department of aeronautics would be charged with the development of aircraft for war uses. Under the direction of a flying officer there would be centered all training, control and direction of the officer and enlisted personnel of the air force. This plan is in effect in Great Britain and Italy.

From this new department other government departments would draw their flying personnel and equipment required for their own service. But besides this service to the Army, the Navy and the Post Office and other governmental aviation agencies, the independent air force would develop aircraft as a major striking force of the country's armed strength.

*Continued on next page**Con—continued*Archibald Douglas Turnbull—*contd. from p. 234*

(h) The loss to the nation of the services of men of young middle age. Such men as fliers would have completed their air usefulness at about 40 and would then, unless trained soldiers or sailors, be of no more use in the ordinary duties of land and sea.

(i) A separate air force would result in division of command.

(j) The enormous cost of the necessary separate establishment, with its obvious duplication of the work already carried on by the army and the navy.

(k) The enormous cost of bombing planes necessary, upon the basis of any test thus far made, to destroy one battleship.

(l) The inability of the Navy, as the nation's first line, or the Army, as the second line, to carry out any mission if deprived of subordinate and trained air forces; a provision, in view of all the above, not practicable with a separate air force.—*Extracts, see 6, p. 251.*

*Con—continued*Kenneth Whiting—*contd. from p. 235*

the secretary of air in case he made a mistake or by the Secretary of the Navy?

The aircraft carriers, ships fitted with catapult, aircraft tenders, under the proposed scheme for a united air service, would all be transferred to the united air service. Who would operate the ships? You would have, we will say, a naval personnel to operate the engineering departments, to navigate the ships, and an air personnel to fly from the ships and back to the ships. You would at once be in the position of having two commanding officers on a ship—the commanding officer of the ship and the commanding officer of the air force on the ship.

The conditions in a war abroad into which the Navy was going would be something like this: The carriers presumably would want the protection of the fleet. The fleet would go along to protect them. The enemy would be reported by scouting planes, and the commanding officer of the air force and the carrier might decide that he would like to use his aircraft at that moment. The admiral in command of the fleet might decide that was not the proper moment to use them. At once you would have conflicting opinions. Who would be responsible for the major decisions? It must rest entirely with the naval officer, and for that reason his air force should be a part of his own service. Practically every ship in the Navy will carry aircraft, even including submarines, in the future.—*Extracts, see 1, p. 251.*

Walter Atlee Edwards—*contd. from p. 235*

amount of experimentation is necessary for their development and for the development of their tactical employment in connection with ships. In carrying on the development the designer must work closely and hand in hand with the operator and be familiar with the situation in which the operator is placed. Military aviation progressed much further during the war than was the case with naval aviation, and in types of machines and the manner of their tactical employment the Army is much further advanced than is the case with the Navy. The naval problem is entirely different from the Army problem, and can only be solved by the Navy.

4. In time of peace the production of many military machines is uneconomical for the Government. Experi-

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*Pro—continued*Lester D. Gardner—*contd. from p. 243*

Aviation supporters do not desire complete freedom from control or unsupervised development. However, they do appeal to the country for the sake of the National Defense for an immediate opportunity for independent action, and later, when their assertions are further demonstrated, a place with other protective agencies commensurate with the importance of a well-considered air policy.—*Extracts, see 3, p. 251.*

Howard E. Coffin—*contd. from p. 238*

between air fleets independent of surface forces and over terrain far removed from the field of operations of either troops or ships. In short, we have discovered a new medium of navigation, a new field in which to decide armed disputes between nations, and the more intelligently and more adequately we set about the development of air tactics as a major element in our scheme of national defense the better it will be for us. It is the function of the personnel of our War and Navy Departments to win victories for our Army and Navy in future conflicts and to this end both services should be unrestricted in the employment of such air forces as are necessary as auxiliaries in their surface operations, but I can not conceive of any adequate and successful development of our national air power by these older and specialized services. Certainly our experience during the last several years would seem conclusive and should now be capitalized.

Any Federal legislation enacted in the present state of the aerial art should be based upon broad general principles of control, should embody a minimum of restrictive detail, and should leave with the administrative agency created the broadest possible powers and latitude of action. The art is too new and precedent too meager to permit of any other method of treatment. The passage of the Winslow or Curry bill or a combination of the two of them, will bring us a long step in the right direction.—*Extracts, see 1, p. 251.*

William Mitchell—*contd. from p. 239*

should be organized entirely to take the offensive on the high seas. The air forces should also be equipped with planes designed to be used as auxiliaries when the Army needs them.

Practically every big air service in the world is organized along those lines. In some places they are not consolidated quite to the extent that the air people want them; and in other places they are completely consolidated. Great Britain has the best air service, I think, today.

The British put all aeronautics under an air ministry, which is co-equal with the army and navy. They draw from a central aeronautical pool the aircraft and crews that are required for any air work, whether civil, military, or naval. If it requires aircraft for use in some particular field, they can take away from one and give to another, thereby getting maximum concentration. For instance, if the army were operating on a continent, as we did in the last war, they could shift their whole air force to it. If it were over the water, they could take their air forces there. If, on the other hand, there was no need for military air forces or naval forces, they could shift to civil aviation. They are keeping up every element and developing it so as to form a basis for their air power all over the world.

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*Con—continued*Walter Atlee Edwards—*contd. from p. 243*

mentation along logical and parallel lines by many is more desirable than by any single bureau or department. Standardization means standing still. Separate sources of supply makes for competition, securing the best material. A single source of supply does not.

5. Normal life in the Army and the Navy in time of peace is exceedingly artificial. It is stimulated through *esprit de corps* and by competition. This competition, to some degree, may be unnatural, but is nevertheless absolutely necessary if stagnation is to be avoided. Healthful competition between the Army and the Navy is desirable, in so far as aviation is concerned. Competition in the air will be eliminated if a united air service is established.

6. Officers and men of a separate service can not be fed into the regular ranks of the Army and the Navy when they cease flying, as is the case at present, and these individuals would become pensioners upon the Government at an early age.—*Extracts, see 1, p. 251.*

William A. Moffett—*contd. from p. 238*

The lack of prosperity in the industry is due not only to lack of Government orders, but a lack of continuing policy. In the Navy we have a policy and we know what we want to do, but it depends on getting money. If we knew that there was a definite program under which we could count on getting so much money a year, the industries, even those which are still going, would know what to do. They would know what to do with respect to material and personnel. They would know when to lay their people off. But we have no continuing program. They know in a general way that the Navy, and the Army, and the Post Office Department will have probably so much money. Even then the individual companies do not know just who is going to get the work. Competition is the only way in which we can legally keep them going.

As to some artificial way of encouraging the industry, from the standpoint of aviation I would be very glad to see that done by subsidy or anything else. My enthusiasm for and belief in aviation is such that I am for anything that could be done to encourage it.—*Extracts, see 1, p. 251.*

A. W. Johnson—*contd. from p. 239*

But even had consolidation of all branches of air service in England proved to be successful—which apparently it has not—it would not follow that such a consolidation is to be recommended in the case of other countries where the conditions upon which the idea of consolidated air service is predicated do not exist. The difference in the geographic position alone of England and of the United States is so great that the strategic problems in the defense of the two countries cannot be compared. Independent, concentrated air warfare against this country is not conceivable. Therefore, a separate, consolidated air service in the United States has no reason for existence.

As to the contention, also based on the example of England, that consolidation of air service would bring about a reduction in the cost of production of aircraft and greater economy in the administration and operation of aviation activities, a survey of England's situation in this respect does not bear out this claim.

A reading over of the second report of the special committee on estimates of the British Parliament held in April and May, 1923, will show that the Royal Air Force is duplicating many of the functions of the army and navy.

*Pro—continued*William Mitchell—*contd. from p. 244*

The British air force has given excellent service to the army and has greatly improved the aeronautical equipment of the British navy. Its influence on the design of the latest capital ships of the British service has been marked. These are really great armored airplane carriers; their guns and their planes can probably destroy any other surface ships that now exist. It appears that they have made all the present battleships as obsolete as when the original Dreadnaught appeared and made all the others obsolete. It is a matter of discussion now whether it would not be better to wipe out every battleship and begin all over again, putting one's faith in entirely new developments which can compete with and be more efficient than these new carriers on the high seas.

I am convinced, having been for practically all my service either in the Air Service itself or in the branch of the Army handling it, that, in proportion to what we as a country put into it in money and effort, we are not getting out of it what we should. That is almost entirely due to our faulty organization.

We are the only country in the world that has every element that goes to make up a proper air force—that is, to develop air power. We are capable of developing a personnel. We have the means of fabrication here. We have the factories. We have the greatest automotive industry, and our metal industries are very good. We have all the resources that go to make up good air power, so that we are the best fitted for leading in air power.

The Army and Navy are the oldest institutions we have. They place everything on precedent. You can't do that in the air business. You have got to look ahead. We have never tried anything that we have studied out that we have not succeeded in. Every time we have tried to develop something new, a better airplane, or better equipment in connection with it, we have either approached it, or accomplished it. We have just as big a field ahead of us as we have behind us. It is not a question of money, either. I think the total amount of money being put into aviation is plenty.

In the past a great proportion of the new devices which have originated in this country have been taken up and utilized by foreign countries to their advantage. In other words, particularly in aviation, the conservatism of the War and Navy Departments has been such that it has been impossible to develop it to the fullest extent in all its branches under them.—*Extracts, see 1, p. 251.*

William Mitchell—*contd. from p. 240*

basis, 72,000 airplanes could be built. In any national emergency that we can visualize, the country certainly does not need more than 3,000 or 4,000 airplanes at the decisive point; these can be built and maintained for a relatively small proportional cost and still have great use in civil and commercial aviation in peace time. The cost of the battleships and their accessories is not all. The navy yards cost tremendous amounts. In the United States and possessions there are about nineteen of these, whose value aggregates \$1,300,000,000. The cost of upkeep and depreciation of these amounts to a vast annual sum.

If the defense of the coast is intrusted to aircraft and the Navy's coast-defense functions are modified, many of these stations can be dispensed with or changed.

In order to carry on offensive operations a surface navy has to have tremendous naval stations and bases, thousands

*Continued on next page**Con—continued*A. W. Johnson—*contd. from p. 244*

Money is asked for separate hospitals, separate medical corps, nursing corps, air cadet academy, floating equipment, and for separate training stations for boys and men. The air service has its own judge advocate and legal corps for the administration of courts martial, boards, etc. It has its separate financial, accounting and supply organizations, and duplicates similar establishments now within the organization of the army and navy. There is a great waste in personnel, and taking up only the case of aircraft carriers it is shown in the report above mentioned that the personnel on aircraft carriers could be materially reduced with aviation an integral part of the navy.

In the United States, naval aviation, by constituting an integral part of the naval establishment, is free from the numerous duplication of costs from which England suffers under the *régime* of a consolidated air service. The existing administrative, industrial and scientific organization of our Navy Department and all of its resources have been taken advantage of in the development of naval aviation, whose foundation rests upon the Navy with little additional overhead over the general overhead charges of the Department. A saving is thus effected in the United States where in England the cost is rising without prospect of stemming the tide.

There should always be full cooperation between the aircraft branches of the Army and Navy. Such cooperation is in force today, despite the general impression to the contrary.—*Extracts, see 4, p. 251.*

Albert Gleaves—*contd. from p. 240*

to 350 miles. In other words, her sea range from base in war time is 180 miles.

Another favorite argument is this: They say the carrier ship is the equivalent of a gun which will shoot 100 miles and discharge a projectile containing several hundred pounds of high explosive, and that therefore the 16-inch gun which has a range of thirty miles, is useless. They explain this statement in this way. The carrier, they say, will approach the enemy fleet and when a hundred miles or so distant will send out torpedo planes. These planes will steer for the unsuspecting enemy and will attack him at dawn or dark, when within torpedo range, which at present is any where from 5,000 to 12,000 yards. The planes will then discharge their torpedoes unobserved by the enemy and return to their own fleet. The author of this scheme does not bother to tell us how the carriers will escape the observation of the other fleet's scouting and bombing planes, or how the torpedo planes will escape the screen composed of submarines, destroyers and aircraft, thrown out at a distance of thirty miles from the battleships and "train."

It is frequently claimed that if we were "amply provided" with airplanes, but had no battleships or forts, planes alone could prevent hostile landing and invasions. This is a matter of opinion, but it is safe to say that if ours or any other nation relied solely upon aviation for protection, it would be fatally handicapped from the beginning of war. We might fight a defensive war for a time, but our merchant fleet would be swept from the sea, our foreign trade which amounts to eight billions yearly would perish. The destruction of sea power means the extinction of our foreign trade. We would be forced to accept the terms of peace made by the enemy. No Admiralty in the world would commit itself to aircraft alone

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*Pro—continued*William Mitchell—*contd. from p. 245*

of miles away from their own country in some cases. These take the form of dry docks, fuel stations, oil and ammunition depots and shops which cost millions of dollars and are quite vulnerable to air attack. The amount of money and effort put into these might be applied to better use for aircraft and submarines.

So far as land forces are concerned, airplanes will reduce the cost of coast fortifications. As they are able to attack seacraft at long distances from the coast they not only will keep surface seacraft entirely away from cannon range of the coast but they will eliminate the necessity for many of the great sea-coast cannon. Every time a large sea-coast cannon is installed on its concrete foundation it costs half a million dollars. In the ten years preceding 1920, the United States expended about \$1,800,000,000 on coast defenses of different kinds.

So long as the budget for the development of aircraft is prepared by the Army, Navy or other agency of the Government, aviation will be considered as an auxiliary and the requisite amount of money, as compared with the older services, will be subject to the final decision of personnel whose main duty is not aviation. This has resulted in an incomplete, inefficient, and ultimately expensive system of appropriating money.

As important as anything else is the placing of one man in charge of aviation who can be held directly responsible for the aeronautical development of the whole country, and, next, an air representative on councils of national defense who has equal power with that of the representatives of the Army and of the Navy. Not only does this give proper weight to aeronautics, both in peace and in war, but the Army and Navy have always deadlocked and always will, upon certain issues where they have equal representation. The introduction of a third service would tend to break this. Eventually all military power of the Government should be concentrated under a single department which would have control over all national defense, no matter whether it be on land, on the sea or in the air. In this way overhead might be cut down, definite and complete missions assigned to air, land and water forces, and a more thorough understanding of the nation's needs would result.—*Extracts, see 5, p. 251.*

Hilary P. Jones *contd. from p. 242*

defending our shore line and coast shipping for 200 miles at sea. Airplanes could not cross the ocean under their own power with an effective military load, therefore, we must intercept and destroy the *airplane carriers* before they get within striking distance of our shores.

The world flight made by army aviators demonstrated beyond argument that seagoing aviation is dependent on surface ships. In addition to supplies transported by merchant ships and to the assistance rendered by Coast Guard vessels there were one or more ships of the Navy assisting during 128 days of the flight. *In the aggregate, 33 ships manned by 339 officers and 5,062 men had some part in this service.* The aggregate distance steamed was 136,566 ship miles. The total fuel thus used by the Navy was 6,299,941 gallons. It is a fair assumption that if the same flight were made again, approximately the same precautions and the same service of surface ships would be required.—*Extracts, see 9, p. 251.*

*Con—continued*Albert Gleaves—*contd. from p. 245*

for national defense; certainly none has ventured to do it.

Great stress has been laid upon the excessive cost of battleships and the cheapness of protection by aviation. Figure out how many planes would be required to carry enough bombs to sink eighteen battleships. How many carriers would it take to carry these planes—and don't forget that the number of carriers is limited by treaty. How then can a very large number of planes be put into the fighting area at sea? A fighting plane, with engine, costs about \$18,000. A torpedo and torpedo plane costs about \$40,000. A Barling bomber and 10,000 pound bomb costs \$400,000. Let us assume the average cost of the plane to be \$30,000 and the time to build, six months. The battleship costs \$40,000,000 and requires three years to build. The advantage is apparently with the airship, but only apparently. The accessories for the airship, such as hangars, flying fields, carriers, launching apparatus, etc., cost millions. The life of a battleship is twenty years; that of an airplane, two to four years. Aviation is not cheap.—*Extracts, see 2, p. 251.*

Secretary of the Navy States Position on Reorganization of Air Services—

Continued from page 237

There is no question by any man in the service that I know of, any officer, in regard to the real value of aircraft to the surface ships. They would all agree that the aircraft was a necessary adjunct and auxiliary; and they would all agree that without the surface ships you could not use aircraft in the Navy. Of course, aircraft operating from the coast is another matter.

In the first place, you cannot get into the air without supplies; gasoline, for instance. That means you have got to have depots. You have got to have depots protected from the enemy's effort. If you are dealing with a sea problem you have got to have your surface supply for the fleet. If you can destroy those bases of supply, there is no possibility of engagement in the air. The range of aircraft is comparatively short, and always will be. We believe that a modern fleet engagement will require the use of aircraft; that a fleet without aircraft would be at a tremendous disadvantage. It follows, of course, that there will be engagements in the air between aircraft, just as there were in the World War; attacks to prevent aircraft from making observation; attacks to prevent spotting planes from making observations in the ports. There will be the dropping of bombs from the air. I regard the statement that the next war will be in the air as an absurdity, partaking of the Jules Verne type of literature.

I do not know of any in the service, with one or two exceptions in the Army possibly, who would regard the Air Service as a principal service. It is regarded as auxiliary, and I think you will find the uniform testimony, so far as the Navy is concerned, is that it is and always must be auxiliary. The claim that there is any attempt to squelch its development, I think, is absolutely without merit, and is really utterly unfair to our services.—*Extracts, see 1, p. 251.*

*Pro—continued*Herbert S. Howard—*contd. from p. 241*

bombed by the Army aircraft to test smoke and gas bombs in special experiments.

The last test and the one of most interest is that of the *Washington*, carried out in November, 1924. This ship, scheduled for scrapping under the limitation of naval armament treaty, represented the latest construction in battleships in our Navy, and from these tests it was intended to find out in as accurate a manner as possible the effect of the explosion of underwater charge representing large bombs upon the structure of the ship and her machinery, which had been partly installed. For these reasons it was decided not to drop the bombs from airplanes, but to place them in certain exact positions with relation to the ship by means of booms and rigging. If dropped from planes, the exact location of the explosions relative to the ship would never be known, while in the way selected the actual danger space around the ship could be determined.

Three tests were carried out with charges representing 2,000-pound bombs, and after each a thorough examination of the ship and the machinery was made. A certain amount of damage was done and leakage caused, yet, though each explosion was well inside the distance from the ship held by the extreme advocates of the airplane bomb necessary to disable her completely, the effect was in no way such that it would have put the ship out of action, nor were the condensers, which all agree are the parts of the machinery most liable to damage, injured in any way. In addition to these tests, two charges representing torpedoes were exploded against the side of the ship.

Following the under-water explosive tests, the next event on the program was to be the dropping of unloaded deck-piercing bombs from airplanes. The tests were set for a Saturday morning. However, the weather was bad, and all day we waited for the planes to come out. On Sunday morning it was clear, with a 40-mile breeze off shore, and again we waited, the wind being too strong for the planes to venture the 40 miles or so to sea. By afternoon, however, two came out, and after one had passed over the target three times and the other eight times to get their bearings they dropped their bombs. Fortunately, one was a hit, so an inspection was made. While it had not penetrated, the effect was such as to indicate that heavier decks would be desirable to meet the menace of airplane bombers.

The next day the weather continued bad, and as it was decided that all the information sought for from bombs had been obtained, the ship was sunk by gunfire.

It must be realized that these bombing tests covered but one special period or phase of the operations of a navy in war, namely, the actual combat after the meeting of opposing forces. Long before the opposing forces meet the fleet may have to steam thousands of miles to find the enemy. Airplanes alone cannot do this, for these tests off the Capes of the Chesapeake showed that 50 miles at sea was not a trip to be lightly undertaken by airplanes.

Another most important point in this question of ships of the water and ships of the air is that of their ability to operate under any conditions of weather and without regard to location.

I have heard it expressed that the vessel which will win consistently will always be that one which is "on the job 24 hours a day," and certainly in the present state of development that vessel is the fighting ship of the sea.—*Extracts, see 8, p. 251.*

*Con—continued*William S. Sims—*contd. from p. 241*

our bombing planes weighs 26,000 pounds and has a carrying capacity of 15,000 pounds. We have another plane—if what I read in the technical papers is correct—that has a carrying capacity of 18,000 pounds. That would carry two 4,000 pound bombs easily enough.

I think that air forces will play a most important part in the next naval war. My idea about the air forces, and also about the other weapon which in some respects is superior to the air forces, and in some respects inferior to them—that is, the submarine—is that with those weapons adequately developed—not excessively—you render it entirely impossible for any enemy or combination of enemies to send across the ocean a fleet of any kind. It simply cannot be done.

If there were no airplanes or submarines, a combination of powers with a surface navy stronger than ours could come across the ocean, keep its lines of communication open and either keep our navy bottled up or destroy it when it came out; they could seize a port on our shore, bring their armies in with transports, and succeed against us. That could be done with a navy stronger than ours.

But the point I make now is this: No matter how strong the combination, or how strong the battleships and battle cruisers, they could not do that thing if we have a reasonable number of submarines, and if we have more airplanes on our coast than they can bring against us. Any nation adequately defended by submarines and airplanes is, in my opinion, immune from attack from over seas.

The limitation of aircraft carriers as established by the Washington arms conference is rather an important business. It seems strange to me that they limited either the aircraft carrier or the tonnage displacement of the ships that we can build. But my opinion is that the power of the airplane carrier as opposed to the battleship is so definite that I do not see any reason for building the 10,000 ton ships we are allowed to build, and the cruisers with eight-inch caliber guns, when we might put airplanes on them.

The British are building up their airplane carriers. They had a number at the end of the war. Some were very new and some were old vessels transformed. They are building a great many since. The Japanese are also building some. And the only ones we have except the *Langley*, are the two that are coming out—the *Lexington* and the *Saratoga*. The *Langley* is not entirely effective: she is only an experimental laboratory.

The airplane carrier is the battleship of the future. It is half the battleship of the future in these new British ships.

An airplane carrier has ten knots speed more than a battleship. Instead of guns she has bombers that are dropping projectiles that can be as big as 4,000 pounds and carry 2,000 pounds of TNT. Now, the biggest projectile that we are firing today weighs something over 2,000 pounds and has 55 or 60 pounds of explosive in it. The other one which the airplane carrier operates with carries 2,000 pounds. And, mind you, this battleship—do not connect it with anything else at all—is entirely immune from attack as long as she controls the air.—*Extracts, see 12, p. 251.*

The Supreme Court of the United States

The Supreme Court of the United States convened October 6, 1924, for the annual term of the Court, which will continue until June, 1925. The 36 weeks of the annual term are divided into 19 weeks of argument, and 17 weeks of recess for the purpose of writing opinions. Since the Court convened the following recesses have been taken: Oct. 27-Nov. 17, 1924; Dec. 15, 1924-Jan. 5, 1925; Feb. 2-Mar. 2; Mar. 23-Apr. 13, 1925.

Compulsory Arbitration of Industrial Disputes Unconstitutional

The cases—Nos. 207 and 299. Chas. Wolff Packing Company, Plaintiff in Error vs. The Court of Industrial Relations of the State of Kansas. In Error to the Supreme Court of the State of Kansas.

The decision—No. 207. Writ of error dismissed. No. 299. Judgment reversed. The validity of the provisions of the Kansas Industrial Relations Act permitting the fixing of hours of labor as part of a system of compulsory arbitration is held invalid, being in conflict with the Fourteenth Amendment to the Constitution.

The opinion of the Court, delivered by Mr. Justice Van Devanter, April 13, 1925, was in part as follows:

This was an original proceeding in mandamus in the Supreme Court of Kansas to compel the Wolff Packing Company to put into effect an order of a state agency, called the Court of Industrial Relations, determining a dispute respecting wages, hours of labor and working conditions in a slaughtering and packing plant owned and operated by the company. The order was made in a compulsory proceeding under a Kansas statute, called the Industrial Relations Act.

After a hearing, the Supreme Court eliminated the paragraphs relating to working conditions, because made without the required notice, and awarded a peremptory writ of mandamus commanding obedience to the other paragraphs.

That judgment was brought to this Court for review and was reversed with a direction that the case be remanded for further proceedings not inconsistent with the opinion rendered at the time.

After receiving the mandate, the state court vacated its original judgment; eliminated the paragraphs relating to working conditions and those fixing wages; also eliminated from the paragraphs fixing hours of labor the clauses relating to pay for overtime; and awarded a peremptory writ of mandamus commanding obedience to what remained of the last paragraphs.

On a rehearing, the court modified that judgment by awarding a peremptory writ of mandamus to compel obedience to the paragraphs fixing hours of labor, including the clauses relating to pay for overtime.

The order, according to its terms, was to remain in force until changed by the Court of Industrial Relations, or by agreement of the parties with the approval of that agency.

The company has brought the case here again—this time on two writs of error. One covers the judgment first entered after receipt of the mandate of this Court, and the other covers the judgment entered on the rehearing. The first of these writs can serve no purpose and must be dismissed. The rehearing was reasonably requested and the judgment entered thereon became the final judgment, the other being superseded by it.

Throughout the mandamus proceedings, the company insisted that the Industrial Relations Act, on which the order was based, was in conflict with the provision of the Fourteenth Amendment that no State shall deprive any

person of liberty or property without due process of law. This insistence was wholly rejected when the original judgment, heretofore reversed, was rendered, and was largely rejected when the judgment on the rehearing was given.

* When the case was first before this Court the opinion then delivered particularly dealt with the question of the validity of the parts of the Act permitting the fixing of wages, the ultimate conclusion being:

"We think the Industrial Court Act, in so far as it permits fixing of wages in plaintiff in error's packing house, is in conflict with the Fourteenth Amendment and deprives it of its property and liberty of contract without due process of law."

That conclusion required a reversal of the judgment of the state court. The parts of the Act permitting the fixing of hours of labor were not specially dealt with, and were not affected by the decision, save as the reasons on which it proceeded might be applicable to them.

The company contends that the decision of this Court, even though not in terms determining the question of the validity of the provisions permitting the fixing of hours of labor, recognized and gave effect to principles which are applicable to that question and if applied will solve it. This contention is well taken.

The declared and adjudged purpose of the Act is to ensure continuity of operation and production in certain businesses which it calls "essential industries." To that end it provides for the compulsory settlement by a state agency of all labor controversies in such businesses which endanger the intended continuity. It proceeds on the assumption that the public has a paramount interest in the subject which justifies the compulsion. The businesses named include, among others, that of manufacturing or preparing food products for sale and human consumption. The state agency charged with the duty of making the settlement is the Court of Industrial Relations. Although called a court it is an administrative board.

When the case was first here the question decided was whether the authority to fix wages as an incident of the compulsory arbitration could be applied to a business like that of the Wolff Company consistently with the protection which the due process of law clause of the Fourteenth Amendment affords to the liberty of contract and rights of property. The question was answered in the negative and the Act was held invalid in so far as it gives that authority.

The assumption in the Act that a business like that in question—preparing food for sale and human consumption—is so far affected with a public interest that the State may compel its continuance, and, if the owner and employees cannot agree, may fix the terms through a public agency to the end that there shall be a continuity of operation and production, was held to be without any sound basis and its indulgence by the state legislature was declared not controlling. The Court recognized that in a sense, all business is of some concern to the public and subject to some measure of regulation, but made it plain

Continued on page 251

Recent Government Publications of General Interest

The following publications issued by various departments of the Government may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Agriculture

THE AGRICULTURAL OUTLOOK FOR 1925. (Department of Agriculture Misc. Circular No. 38.) Price, 5 cents.
Domestic demand, foreign demand, agricultural credit, farm labor and equipment, etc.

VARIETAL EXPERIMENTS WITH HARD RED WINTER WHEATS in the Dry Areas of the Western United States; by J. Allen Clark, and John H. Martin. (Department of Agriculture Bulletin No. 1276.) Price, 10 cents.

Varieties compared, location of the experiments, experimental methods, etc.

CROP ROTATION AND CULTURAL METHODS AT THE AERON (Colo.) Field Station, in the 15-Year Period from 1909 to 1923, Inclusive; by J. F. Brandon. (Department of Agriculture Bulletin No. 1304.) Price, 5 cents.

Soil, Climatic factors, scope of the experiments, average yields, results, fallow, and soil blowing, etc.

A STATISTICAL STUDY OF THE RELATION BETWEEN SEED-EAR CHARACTERS AND PRODUCTIVENESS IN CORN; by Frederick D. Richey, and J. G. Willier. (Department of Agriculture Bulletin No. 1321.) Price, 5 cents.

Previous investigations, material and methods, correlations among the ear characters, etc.

COTTON PRODUCTION AND DISTRIBUTION, Season of 1923-24. (Bureau of Census Bulletin No. 156.) Price, 10 cents.

Production, consumption and stock of cotton, imports and exports of cotton, etc., with diagram and map.

HOT-WATER TREATMENT OF DORMANT AND SPROUTED SEED CANE; by P. A. Yoder. (Department of Agriculture Circular No. 337.) Price, 5 cents.

A hot-water treatment to kill insect pests.

Aviation

AN ANALYSIS OF THE DEFORMATION OF THE MOORING SPINDLE of the Shenandoah; by L. B. Tuckerman, and C. S. Aitchison. (Bureau of Standards Technologic Paper No. 270.) Price, 10 cents.
Methods of test, results and discussion of tests, with conclusions.

Bees

THE BEE LOUSE, *Braula Coeca*, in the United States; by E. F. Phillips. (Department of Agriculture Circular No. 334.) Price, 5 cents.

Infested apiaries in Maryland, description of the species, geographical distribution, feeding habits, remedies, etc.

Census

FOURTEENTH CENSUS OF U. S., State Compendium, South Dakota. Price, 25 cents.

Statistics of population, occupation, agriculture, drainage, manufactures, and mines and quarries, for the State, counties, and cities.—State Compendium, Tennessee. Price, 30 cents.

Citrus Fruits

CITRUS PECTIN; by Homer D. Poore. (Department of Agriculture Bulletin No. 1323.) Price, 5 cents.

Results of previous investigations, preliminary experiments, methods of extraction, how to make citrus jellies and marmalades, with bibliography.

BY-PRODUCTS FROM CITRUS FRUITS; by E. M. Chace. (Department of Agriculture Circular No. 232, reprint.) Price, 5 cents.

Methods for the manufacture of citrus by-products here given, and are adapted for use on a small or large scale, with bibliography.

Education

AMERICAN SCHOOL BUILDINGS; by Fletcher B. Dresslar. (Education Bureau Bulletin, 1924, No. 17.) Price, 45 cents.

Location, soil and drainage, protection against dampness, planning, construction and equipment, lighting, heating.

Electrical Tests

MEASUREMENT OF ELECTRICAL RESISTANCE AND MECHANICAL STRENGTH OF STORAGE-BATTERY SEPARATORS; by C. L. Snyder. Bureau of Standards Technologic Paper No. 271.) Price, 10 cents.

TABLES FOR CALCULATION OF MUTUAL INDUCTANCE OF CIRCUITS WITH CIRCULAR SYMMETRY ABOUT A COMMON AXIS; by W. F. Grover. (Bureau of Standards Scientific Paper No. 498.) Price, 10 cents.

Fatigue Tests

DESIGN OF SPECIMENS FOR SHORT-TIME FATIGUE TESTS; by L. B. Tuckerman, and C. S. Aitchison. (Bureau of Standards Technologic Paper No. 275.) Price, 5 cents.

Principles of specimen design in endurance-run and in short-time fatigue testing, test specimens for different types of fatigue machines, with conclusions.

Food Research

A STUDY OF THE PELLAGRA-PREVENTIVE ACTION OF Dried Beans, Casein, Dried Milk, and Brewer's Yeast, with a Consideration of the Essential Preventive Factors Involved; by Joseph Goldberger and W. F. Tanner. (Public Health Reprint, No. 984.) Price, 5 cents.

Gas Testing

A CRITICAL STUDY OF THE BURELL INDICATOR FOR COMBUSTIBLE GASES IN AIR; by Lowell H. Milligan. (Bureau of Mines Technologic Paper No. 357.) Price, 10 cents.

Sources of error in testing, use of combustible gases other than methane, with summary and conclusions.

Government Printing Office Style Manual

STYLE MANUAL OF THE GOVERNMENT PRINTING OFFICE. Revised edition October, 1924. Price, 50 cents.

Rules and style of composition, Congressional Record style, contractions, reports, documents, and laws; style specification.

Lumber

LUMBER MARKET IN THE NETHERLANDS; by Axel H. Orholm. (Department of Commerce Trade Promotion Series No. 4.) Price, 45 cents.

Covers forests and domestic lumber production, principal woods used in the Netherlands, lumber manufacture and consumption, with appendix and illustrations.

Merchant Marine

GOVERNMENT AID TO MERCHANT SHIPPING; by Grosvenor M. Jones. (Department of Commerce Special Agents Series No. 119, reprint.) Price, 50 cents.

Study of subsidies, subventions and other forms of State aid in the principal countries of the world.

National Parks

GLIMPSES OF OUR NATIONAL PARKS. Price, 10 cents.

Yellowstone, Yosemite, Sequoia and General Grant, Mount Rainier, Crater Lake, Mesa Verde, Glacier, Rocky Mountain, Hawaii, Lassen Volcanic, Mount McKinley, Grand Canyon, Lafayette, Hot Springs, Zion, and other national parks.

Public Finance

BOLIVIAN PUBLIC FINANCE; by Charles A. McQueen. (Department of Commerce Trade Promotion Series No. 6.) Price, 20 cents.

Revenue and expenditures, the public debt, currency, exchange and banking, general topics, and general economical description of Bolivia, with general conclusions.

ANNUAL REPORT OF THE SECRETARY OF THE U. S. TREASURY ON THE STATE OF THE FINANCES, for the Fiscal Year Ended June 30, 1924, with Appendices. Price, \$1.25.

History of Air Navigation—continued from page 221

York to San Francisco in one day in a Curtiss Pursuit September 8, 1924, the "Round-the-World" flyers arrived in Washington, D. C.

A Digest of the Provisions of the Curry Bill—continued from page 233

That the Air Force shall be so trained as to comprise a combatant force of the United States with a view to operating either with the armed land or sea forces of the United States, or with both combined, or independently of either, as the President may determine. The President shall be, and is hereby, authorized to attach such units of the Air Force as may be necessary for the cooperation with the armed land and sea forces of the United States in time of war or threatened hostilities, and during maneuvers, target practice, and such other exercises as may be held by those forces: *Provided*, That when such units are so attached, they shall be under the command of the designated commander of the land or sea force, or both, as the case may be. Should the offensive or defensive operation in time of war or threatened hostilities and the maneuver or exercise in time of peace be from their nature aeronautical, the President shall be, and hereby is, authorized to attach to the Department of Air, such units of the armed land or sea forces as he may deem necessary: *Provided further*, That when such units are so attached, they shall be under the command of the designated commander of the Air Force.

Sec. 15. Commissioned personnel of the Air Force.—That for the initial organization of the Regular Air Force the commissioned personnel shall not exceed 2,000 in the line of the Regular Air Force and 500 in the staff of the Regular Air Force, exclusive of medical officers. The commissioned personnel of the medical branch of the Regular Air Force shall not exceed 250. Appointments and promotions of such commissioned personnel shall be made by the President by and with the advice and consent of the Senate. In the Regular Air Force there shall be 12 brigade marshals, one of whom shall be designated Commander of the Air Force, and shall have the rank of division marshal while serving in that capacity, and the number in the various grades below the rank of brigade marshal, except in the grades of lieutenant and ensign, shall not exceed the following percentages of the total authorized commissioned strength of the Regular Air Force, namely: Colonels, 3 per centum; commanders, 4 per centum; majors, 10 per centum; captains, 20 per centum: *Provided*, That no officer shall exercise command over flying units except a flying officer: *Provided further*, That subject to the approval of the Secretary of Air, all flying officers holding permanent commissions in the Army, Navy, Marine Corps, or Coast Guard shall be eligible for transfer to, appointment, and commission in the Regular Air Force without examination in the grade in the Regular Air Force corresponding to the grade held in the Army, Navy, Marine Corps, or Coast Guard at the time of transfer: *And provided further*, That all regular and emergency flying officers of the Army, Navy, Marine Corps, and Coast Guard, who served honorably and at least six months on active duty between April 6, 1917, and the passage of this Act with the Army, Navy, Marine Corps or the Coast Guard shall be eligible for transfer to, appointment, and commission in the Regular Air Force subject to such examination as may be prescribed by the Secretary of Air and will take grade and rank in grade in accordance with length of active commissioned service.

Sec. 16. The Secretary of Air is authorized to formulate

and prescribe the tables of organization of personnel, matériel, and all other matters relating to the organization of the Air Force, etc.

That there is hereby created a retired list for the Regular Air Force: *And provided further*, That when an officer of the Regular Air Force has served thirty years, either as an officer or airman in the regular or volunteer service, or both, he shall, if he makes application therefor to the President, be retired from active service and placed on the retired list, and when an officer is sixty years of age, he shall be retired from active service and placed on the retired list: *Provided*, That when any officer is fifty-five years of age, he may be retired from active service and placed on the retired list at the discretion of the President: *Provided further*, That when any officer has become incapable of performing the duties of his office, he shall be either retired from active service or wholly retired from the service by the President, as hereinafter provided.

Sec. 17. Provides for classification of officers; Sec. 18. Flying cadets defined, number of appointments, pay and allowances, etc.; Sec. 19. Provides for warrant officers; Sec. 20. Provides for enlisted personnel of the Air Force; Sec. 21. Reserve units and reserve force.—That the Secretary of Air, for the purpose of forming an adequate aviation reserve, is authorized to organize reserve units in such numbers and at such places as he, in his discretion, may designate; Sec. 22. Provides for constitution of reserve air force; Sec. 23. Reserves on active duty.

Sec. 25. The Secretary of Air is authorized to establish aerial routes throughout the United States and its possessions and dependencies and, to this end, shall cooperate with the States.

Sec. 26. Provides for cooperation with civil departments of the Government; Sec. 27. Intelligence and air attachés.—The Secretary of Air shall assign personnel of the Department of Air for duty with the embassies of the United States in foreign countries; Sec. 28. Provides for detail of officers to other Government and outside agencies; Sec. 29. The Department of Air is specifically charged with the aerial defenses of the United States and its possessions and dependencies; Sec. 30. Provides for the administration of the Department of Air; Sec. 31. Provides for awards of medals of honor, distinguished flying crosses, and distinguished flying medals; Sec. 32. Regulations governing air navigation and air routes to be drafted by the Department of Air; Sec. 33. Provides regulations regarding airdromes and landing fields; Sec. 35. Provides for issuance of licenses by Department of Air for operation of aircraft; Sec. 36. Licenses of operators; Sec. 37. Provides for licenses of airdromes and landing fields; Sec. 38. The Department of Air authorized to fix license fees; Sec. 39. Provides for punishment for violation of any of the provisions of this Act or of the rules and regulations of the Department of Air; Sec. 40. Relative to limits of jurisdiction of department; Sec. 41. Relates to jurisdiction of courts; Sec. 42. War risk benefits.—That the benefits of the War Risk Insurance Act of October 6, 1917, as amended, are hereby extended to include the commissioned and enlisted personnel of the Air Force.

Sec. 43. Provides for enforcement of regulations of this Act; Sec. 44. Provides for annual report; Sec. 45. Provides for subsequent amendments to be recommended to Congress; Sec. 46. General definitions; Sec. 47. Effect of invalidity of any section of Act; Sec. 48. Provides that the act shall take effect from and after date of passage.

The Supreme Court of the United States—continued from page 248

that the extent to which regulation reasonably may go varies greatly with different cases of business and is not a matter of legislative discretion solely, but is a judicial question to be determined with due regard to the rights of the owner and employees. Care was taken to point out that operating a railroad, keeping an elevator, conducting an elevator and following a common carrier are not all in the same class, and particularly to point out the distinctions between a quasi-public business conducted under a public grant imposing a correlative duty to serve. The conclusion was that power to compel the continuance of a business affected with a public interest is altogether exceptional.

Applying these principles, the Court was of opinion that the business in question is one which the State is without power to compel the owner and employees to continue.

On further reflection we regard the principles so stated and applied as entirely sound. They are as applicable now as they were then. The business is the same and the parties are the same. So, we reach the same conclusion now that we reached then.

The system of compulsory arbitration which the Act

establishes is intended to compel, and if sustained will compel, the owner and employees to continue the business on terms which are not of their making. Such a system infringes the liberty of contract and rights of property guaranteed by the due process of law clause of the Fourteenth Amendment. "The established doctrine is that this liberty may not be interfered with, under the guise of protecting the public interest, by legislative action which is arbitrary or without reasonable relation to some purpose within the competency of the State to effect."—*Meyer v. Nebraska*, 262 U. S. 390, 399.

The authority which the Act gives respecting the fixing of hours of labor is merely a feature of the system of compulsory arbitration and has no separate purpose. As a part of the system it shares the invalidity of the whole. Whether it would be valid had it been conferred independently of the system and made either general or applicable to all business of a particular class we need not consider, for that was not done.

It follows that the state court should have declined to give effect to any part of the order of the state agency.—*Extracts.*

A Glossary of Aeronautical Terms—continued from page 231

Landplane: An airplane designed to rise from and alight on the land.

Shipplane: A landplane designed to rise from and alight on the deck of a ship.

Propeller Airplane: An airplane with the propeller or propellers forward of the main supporting surfaces.

Amphibian Plane: An airplane designed to rise from and land on either water or ground.

U. S. Navy Types of Planes: Training, fighting, observation, patrol, "combined service" (bomber, scouting, or bombing).

U. S. Army Types of Planes: Training, pursuit, bombing, observation.

Non-Military Uses of Planes: Mail, freight, passenger carrying, sky-writing, aerography, agricultural, forest patrol, racing.

Terms Common to Aircraft

Airport: The terminal of an airway, provided with landing places, hangar, repair and supply facilities.

Airfoil: A wing-like structure, flat or curved.

Airway: An aerial highway, developed by the provision of landing fields, radio station, etc., for transportation between three or more traffic centers or extending across a large geographical area.

Fuselage: The elongated structure, of approximately streamline form, to which are attached the wings and tail unit of an airplane. In general, it contains the power plant, passengers, cargo, etc.

Ceiling: Absolute; the maximum height above sea level

which a given airplane could reach theoretically, assuming standard air conditions.

Climb: Rate of climb—The vertical velocity with reference to the air.

Glide: A steep glide or flight.

Drag: The component parallel to the relative wind of the total air force on an aircraft or airfoil.

Drift: The lateral velocity of an aircraft, due to air currents or other cause.

Fuselage (airship): The main structure of a rigid airship, consisting of a covered elongated framework which encloses the gas bags and supports the cans and equipment.

Hull (seaplane): The portion of a boat seaplane which furnishes buoyancy when in contact with the surface of the water. The main supporting surfaces are attached to it and it contains accommodations for the crew and passengers.

Lift: The component perpendicular to the relative wind and in the plane of symmetry of the total air force on an aircraft or airfoil.

Load: Dead load—The structure, power plant, and fixed equipment of an aircraft; Full load—Dead load plus useful load; Pay load—that part of the useful load from which revenue is derived, viz, passengers and freight; Useful load—the crew and passengers, oil, fuel, ballast, ordnance, and portable equipment.

Maneuverability: That quality in an airplane which makes it possible for the pilot to change its altitude rapidly.

Sources From Which Material in This Number Is Taken

Articles for Which No Source Is Given Have Been Specially Prepared for This Number of THE CONGRESSIONAL DIGEST.

- 1—Extracts from Hearings before the Select Committee on Inquiry into Operations of the United States Air Service, U. S. House of Representatives, in Senate, January 1924.
- 2—Extracts from address before the Senate Civil Aeronautics Committee, 1924.
- 3—Extracts from Article in Washington Post, February 22, 1923.
- 4—Extracts from Proceedings of U. S. Naval Academy, Vol. 55, No. 1, September, 1923.
- 5—Extracts from Article in California Evening Post, March 14, 1923.
- 6—Extracts from Article in Current History Magazine, April, 1923.
- 7—Extracts from Letter to Chairman McNamara from Military Affairs Commission, in reply to Advance Report by the Secretary

- 8—War on the Carry Bill (H. R. 12137).
- 9—Extracts from Article in The Independent, March 21, 1923.
- 10—Extracts from Article in The Northern Independent, March 21, 1923.
- 11—Extracts from Aviation Year Book, 1924: L'Aéronautique, 1924-25.
- 12—Extracts from National Aeronautical Review, February, 1924.
- 13—Extracts from Hearings before the Senate Civil Aeronautics Committee, as reported in the Press, March 17, 1924.
- 14—Extracts from Article in National Aeronautics Review, March, 1923, and the introduction to the Bureau of Air Transportation, by R. E. Kennedy, 1924.

Difficult Public Questions

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